U.S. DEPARTMENT OF COMMERCE
National Technical Information Service

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OLENTANGY ENVIRONMENTAL CONTROL CENTER AND INTERCEPTOR SYSTEM

DELAWARE COUNTY, OHIO BOARD OF COMMISSIONERS

ENVIRONMENTAL PROTECTION AGENCY

PREPARED FOR
ENVIRO CONTROL, INC.

JULY 1976

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15. SUPPLEMENTARY NOTES

With the Assistance of Enviro Control, Inc. Rockville, Maryland

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16. ABSTRACT

This final environmental impact statement on a Delaware County, Ohio, project proposes the construction of a 1.5 MGD tertiary treatment plant adjacent to the Olentangy River immediately above the Delaware-Franklin County line, with discharge adjacent to the site. Interceptor sewers will serve portions of the Olentangy and Alum Creek basins in southern Delaware County. The southern portion of the western Scioto River basin will be permanently served by the proposed Dublin interceptor, with treatment at the Columbus Jackson Pike plant. Ozone will be used for disinfection at the Olentangy Environmental Control Center. Ammonia control is anticipated to be sufficient as designed. There has been no demonstrated public health hazard from sewage treatment plant aerosols. Secondary impacts from the proposed project will require local mitigation.

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UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY

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ENVIRONMENTAL IMPACT STATEMENT

FINAL

Olentangy Environmental Control Center and Interceptor System

Delaware County, Ohio Board of Commissioners

REPRODUCED BY
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Project No. C390698

FINAL ENVIRONMENTAL IMPACT STATEMENT
For The
DELAWARE COUNTY, OHIO BOARD OF COMMISSIONERS
OLENTANGY ENVIRONMENTAL CONTROL CENTER AND INTERCEPTOR SYSTEM

Prepared By The
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION V
CHICAGO, ILLINOIS

With The Assistance Of
ENVIRO CONTROL, INC.
ROCKVILLE, MARYLAND

APPROVED BY:

GEORGE R. ALEXANDER, JR.
REGIONAL ADMINISTRATOR

JULY 1976

SUMMARY SHEET

( ) Draft

(X) Final

U.S. Environmental Protection Agency Region V, Chicago

1. (X) Administrative Action

    ( ) Legislative Action

2. Major Conclusions of the Final EIS

a. The extent of future sewer capacity in Franklin County to accomodate additional service areas is not clear. Capacity has been a principal argument against regionalization in previous discussions. Sewer capacitite were projected in 1969 by the Franklin County Regional Planning Commission. The recent infiltration-inflow analysis indicated wet weather capacity constraints in the two areas of the system which have combined sewers. Corrections have been proposed to alleviate these constraints. We were unable to obtain sufficient design engineering information to evaluate the future capacity of the major columbus interceptors.
(Chapter 3, Section C-9-b)

b. The local site chosen in the Draft EIS, OR-3, remains the best of the local alternatives.
(Chapter 4, Section C-1)

c. Six regional sub-alternatives have been developed for the Final EIS. Their configurations and estimated costs are attached. Five of these sub-alternatives have been eliminated on the basis of sewer capacity, lack of design information, and institutional feasibility. Sub-alternative six, involving a local treatment plant for the Olentangy and Alum Creek basins, and regionalization of the Scioto flow, has been chosen as being cost-effective and institutionally feasible, although it is not the least-cost alternative.
(Chapter 4, Section C-2)

d. The regional alternative for the Scioto Basin is preferred to the local alternative because it has a lower cost and will provide more rapid service to the Shawnee Hills area than the local alternative. Muifield Village and Shawnee Hills, on the west side of the river, will be permanently served by the Dublin project, which provides for a northern interceptor extention from Dublin to Delaware County. Providing service to this area is desirable because it will help to relieve an area with existing water quality problems. The remainder of the Scioto basin in the Delaware County planning area may be served either by Columbus or by Delaware County. This will be determined through additional facilities planning performed by Delaware County.
(Chapter 4, Section C-4)

e. The treatment plant will be sized as designed, at 1.5 MGD. (Chapter 3, Section D-1)

f. There has been no demonstrated public health hazard from sewage treatment plant aerosols. However, adverse impacts will be mitigated if they become reasonably discernable. (Chapter 5, Section B-2)

g. Ammonia control is anticipated to be sufficient as designed in the proposed treatment facility. Breakpoint chlorination would be the only alternative suitable for occasionally needed ammonia control. The potential operational difficulties of this complex process outweigh the benefits of additional removal. (Chapter 4, Section E-2-f)

h. Chlorine limitation is essential to protect the varied, high quality streamlife of the Olentangy River. Ozonation is recommended for disinfection rather than chlorination-dechlorination. The slight additional cost is justified to protect aquatic organisms. (Chapter 4, Section E-2-f)

i. Secondary impacts from the proposed project will require local planning efforts for mitigation. (Chapter 5, Section C-2 and C-3)

3. Description of the Action

A sewage treatment plant of 1.5 MGD to be expanded to 3.0 MGD by the end of the 20 year planning period will be constructed in South-Central Delaware County Ohio, between state route 315 and the Olentangy River, immediately above the Delaware-Franklin county line. The treatment process is a two-stage activated sludge facility, including phosphorus removal measures and tertiary rapid sand filters. The effluent will be ozonated prior to discharge. Sludge will be aerobically digested at the treatment site and then hauled to a State-approved sanitary landfill site. The facility will discharge to the adjacent Olentangy River, just above the county line.

A new system of interceptors will be constructed in three phases. Phase I will serve the Alum Creek Lake and Westerville Reservoir areas, Powell Road east of route 315, and a residential area north of Powell Road and west of route 315. It is Phase I which is currently receiving the 75% federal grant. Phase II extends to serve additional areas south of Alum Creek Lake and the Village of Powell and up to Home Road in the Olentangy basin. Phase III extends around Alum Creek Lake and adjacent areas, and in the Olentangy basin up to Delaware Township. Muirfield Village and Shawnee Hills in the Scioto basin will be permanently served by an interceptor extension via the Dublin grant. Additional facilities planning at the time that sewer service is extended into the planning area beyond Phase I will determine the cost-effective alternative for service in the remainder of the Scioto basin within the Delaware County planning area.

4. Environmental Impact

a. Water

The present waste load allocation and water quality standards will be met by the project. Water pollution from malfunctioning septic tanks will be gradually eliminated as homes are sewered. Erosion, sedimentation, and turbidity will be minimized through mitigative construction measures.

b. Air

Emissions from the treatment facility will not be a problem. New growth will alter ambient air quality, and this must be considered in future air permits. There has been no demonstrated evidence of any health hazard from microbe transmission in sewage treatment aerosols.

c. Land Use

Construction of the interceptors and treatment plant will have a short term adverse impact. A landfill for sludge disposal is an impact, more adverse than utilizing the sludge on land.

Secondary impacts will include increased rates of growth, and growth following the interceptor patterns. A greater range of housing types will be possible. Active local planning is necessary to reduce runoff and erosion, maintain open space, and to provide adequate public services.

d. Biology

Terrestrial plants and animals will be displaced by construction. Revegetation after construction will provide considerable biological recovery. The high quality biology of the Olentangy will be protected by using ozonation for disinfection.

e. Sensitive Areas

An archeological survey of the treatment plant site is underway and all adverse impacts to the possible cultural resources will be mitigated. Highbanks Parks will be avoided in the interceptor configurations. Impacts on endangered aquatic species cannot be precisely delineated. Loss of prime agricultural land will occur with increasing residential development. Recreational development around the Alum Creek Lake will be greatly facilitated. Flood plain development may be stimulated by the presence of sewers if local land use controls are not adopted. Discharge to the Olentangy Scenic River segment will be of exceptionally high quality.

f. Aesthetics

The visual impacts of the treatment plant have been reduced through landscaping and architectural design. The plant will be largely screened from view in Highbanks Park. Odor and noise problems are not anticipated to be significant, because of mitigation.

5. Alternatives Considered

a. Flow Reduction in the proposed service area.

b. Interceptor phasing and construction alternatives.

c. Site Locations

1. local - 10 sites examined

2. regional - 6 sites examined, several configurations considered.

d. Treatment Process

1. treatment and discharge to surface waters

2. wastewater reuse

3. land disposal

4. chlorine removal and ozonation

5. ammonia removal

e. Sludge Disposal - five alternative combinations examined

f. Discharge Points

1. at treatment plant

2. below scenic river segment

g. No Action

6. Federal, State, and Local Agencies Notified of this Action

Federal

- Senator John Glenn
- Senator Robert Taft, Jr.
- Representative Samuel L. Devine
- Representative Chalmers P. Wylie

- Council on Environmental Quality
- Environmental Protection Agency
- Army Corps of Engineers
- Department of the Interior
- Geological Survey
- Fish & Wildlife Service
- Dept. of Housing and Urban Development
- Dept. of Health, Education, and Welfare
- Dept. of Commerce
- Forest Service
- National Park Service
- Ohio River Basin Commission

State

- Honorable James A. Rhodes
- Representative Mike Stinziano
- Ohio Environmental Protection Agency
- Ohio Department of Natural Resources
- Ohio Water Development Authority
- Ohio Department of Transportation
- Ohio Department of Health
- Ohio Historical Society
- Ohio Attorney General

Local

- Delaware County Board of Commissioners
- Delaware County Engineer
- City of Delaware
- Delaware Co. Regional Planning Commission

- Metropolitan Park District of Columbus & Franklin County
- Franklin County Board of Commissioners
- Director of Public Services, Columbus
- Mid-Ohio Regional Planning Commission
- Mid-Ohio Health Planning Federation
- Franklin County Sanitary Engineer
- Delaware Co. Health Planning Federation
- City of Columbus
- City of Westerville
- City of Worthington
- City of Dublin
- Village of Powell
- Westerville City Engineer
- Delaware Co. Health Department
- Delaware Soil & Water Conservation District
- Columbus Department of Development
- Columbus Department of Recreation & Parks
- Berlin Township Trustees
- Liberty Township Trustees
- Orange Township Trustees

7. Dates

Statement made available to the Council on Environmental Quality and the Public:

Draft	February, 1976
Final	August, 1976

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This document was prepared with the assistance of Enviro Control, Inc., Rockville, Maryland.

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CHAPTER I
BACKGROUND

A. Identification of Grant Applicant

The grant applicant for the proposed Olentangy Environmental Control Center and Interceptor System, Delaware County, Ohio, is the Delaware County Board of Commissioners. The Grants Administration project number is (C390698). The Sanitary Sewerage Facilities Plan for South-Central Delaware County, Ohio was prepared in July, 1974, revised in August, 1974, and supplemented with the Response to U.S. Environmental Protection Agency Region V Questions in December, 1974. The project is number 10 on the Ohio Priority List. The final effluent limitations permit issued by Ohio EPA for the originally proposed project is included in Appendix A.

B. Description of the Action Proposed in the Facilities Plan

A sewage treatment facility of 1.5 MGD, with a peak capacity of 3.4 MGD will be constructed in south central Delaware County, Ohio, between State route 315 and the Olentangy River. This will serve the area for the 20 year planning period. Ultimate capacity beyond the planning period is 6 MGD, as stated in the Facilities Plan.

The treatment process is a two-stage activated sludge facility, including phosphorous removal measures. This is followed by tertiary rapid sand filters, chlorination, and post-aeration. Sludge will be aerobically digested at the treatment site, and then hauled to a State-approved sanitary landfill site.

The facility will discharge to the Olentangy River adjacent to the treatment plant site just above the Delaware-Franklin County line.

A new system of interceptors will be built to serve the Olentangy Environmental Control Center, in three phases. Phase I will serve the Alum Creek Lake and Westerville Reservoir areas, Powell Road east of route 315, and a residential area north of Powell Road and west of route 315. Phase II extends to serve additional areas south of Alum Creek Lake. The south part of the O'Shaughnessy Reservoir on the Scioto will be included at this time. Sewers will extend up to Home Road in the Olentangy basin, branching to serve the Carriage Road area and the Powell area. Phase III extends around Alum Creek Lake and adjacent areas; extensively along the O'Shaughnessey Reservoir and its surrounding basin; and in the Olentangy basin up to Delaware Township. The construction of collecting sewers will be a local responsibility.

C. Location of the Proposed Action

The service area proposed for the next 20 years is in south central Delaware County, Ohio, located between Columbus (Franklin County) and the city of Delaware (Delaware County). Figure 1-1 illustrates the regional context of the service area. Figure 1-2 details the service area and the proposed project location. The Scioto River and three of its tributaries, the Olentangy River, Alum Creek, and Big Walnut Creek parallel each other in Delaware County.

Southern Delaware County has traditionally been an agricultural area, but with expansion of the Columbus metropolitan

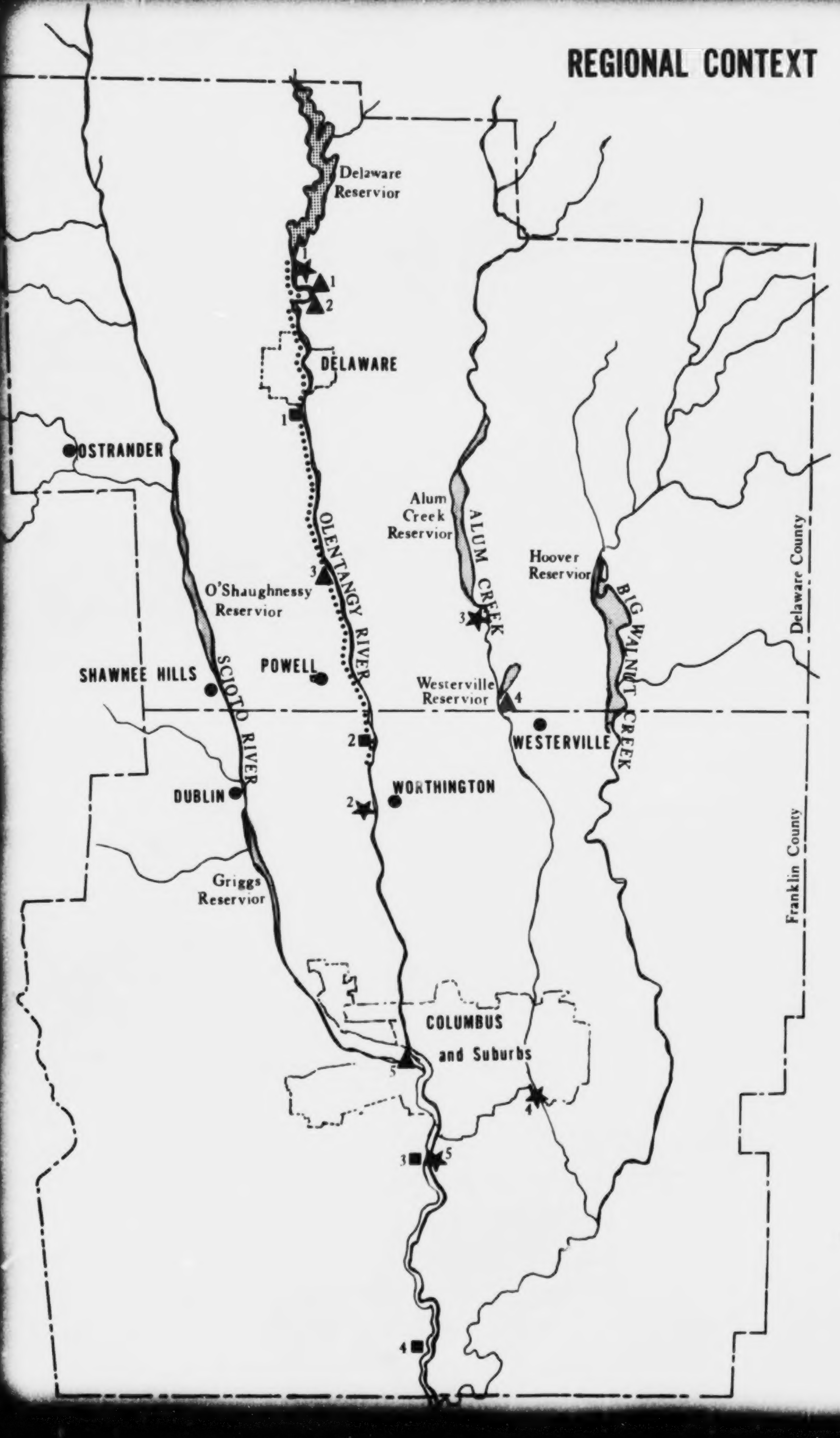


Figure 1-1.

·········· State Scenic River

★ Selected USGS Stream
Gaging Stations

1. Delaware
2. Worthington
3. Africa
4. Columbus
5. Columbus

▲ Selected Water Supply

1. City of Delaware
2. City of Delaware
3. Del Co Water Comp
4. Westerville
5. Columbus (emergen

■ Selected Existing Sew
Treatment Plants

1. Delaware City
2. Worthington Hills
3. Jackson Pike
4. Columbus Southerl

REGIONAL CONTEXT

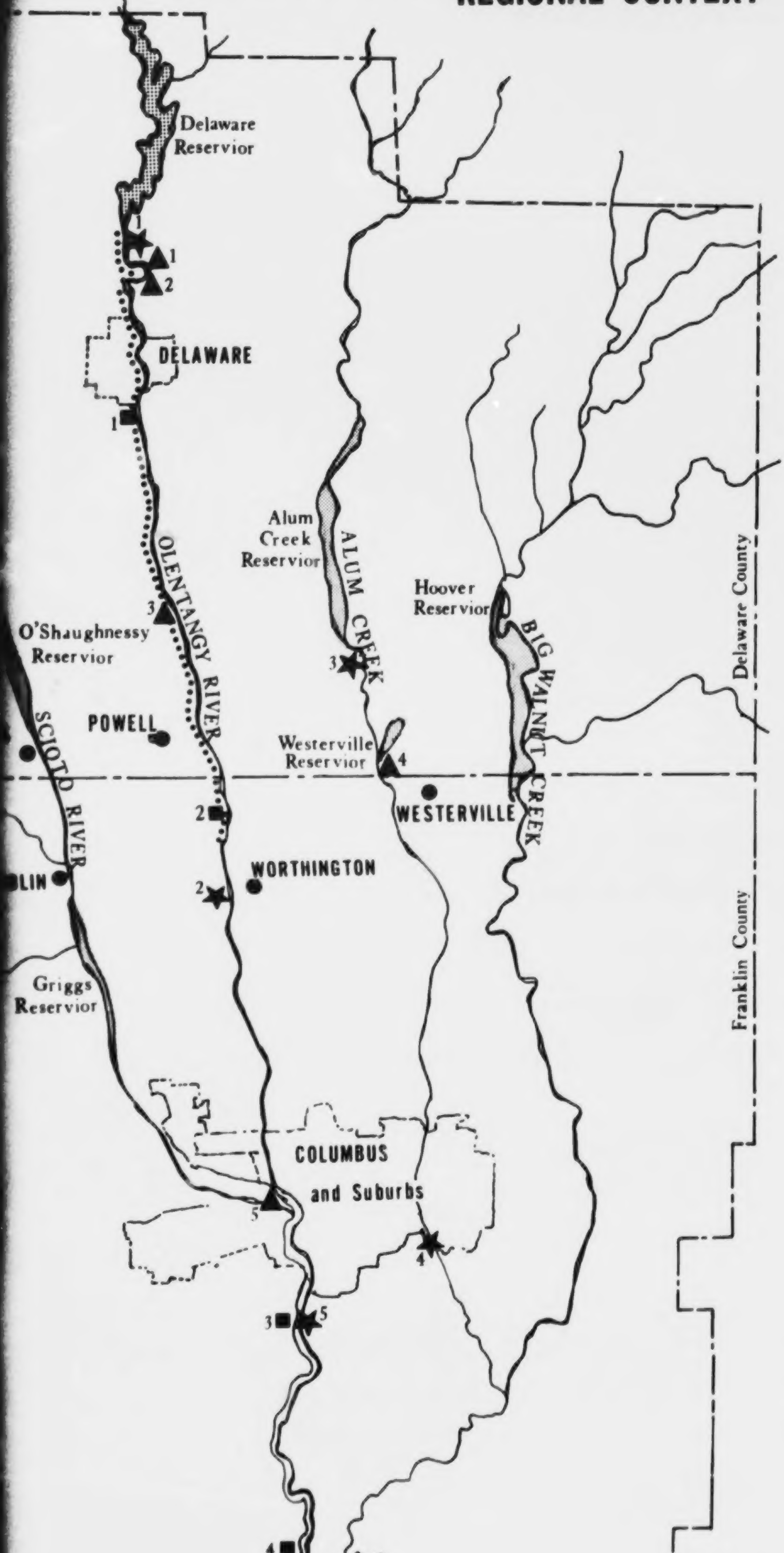


Figure 1-1.

••••••• State Scenic River

★ Selected USGS Stream Gaging Stations

1. Delaware
2. Worthington
3. Africa
4. Columbus
5. Columbus

▲ Selected Water Supply Intakes

1. City of Delaware
2. City of Delaware
3. Del Co Water Company
4. Westerville
5. Columbus (emergency)

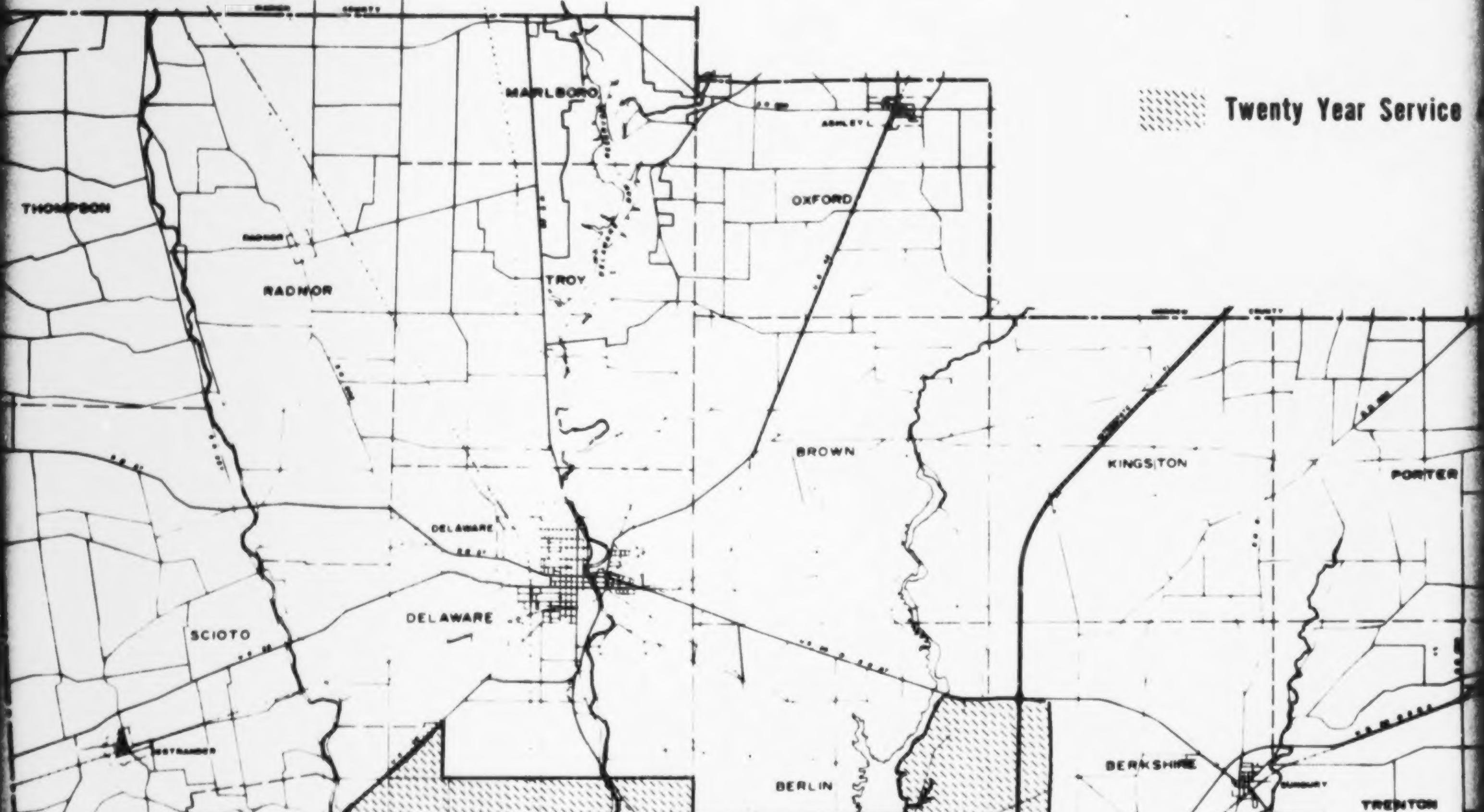
■ Selected Existing Sewage Treatment Plants

1. Delaware City
2. Worthington Hills
3. Jackson Pike
4. Columbus Southerly

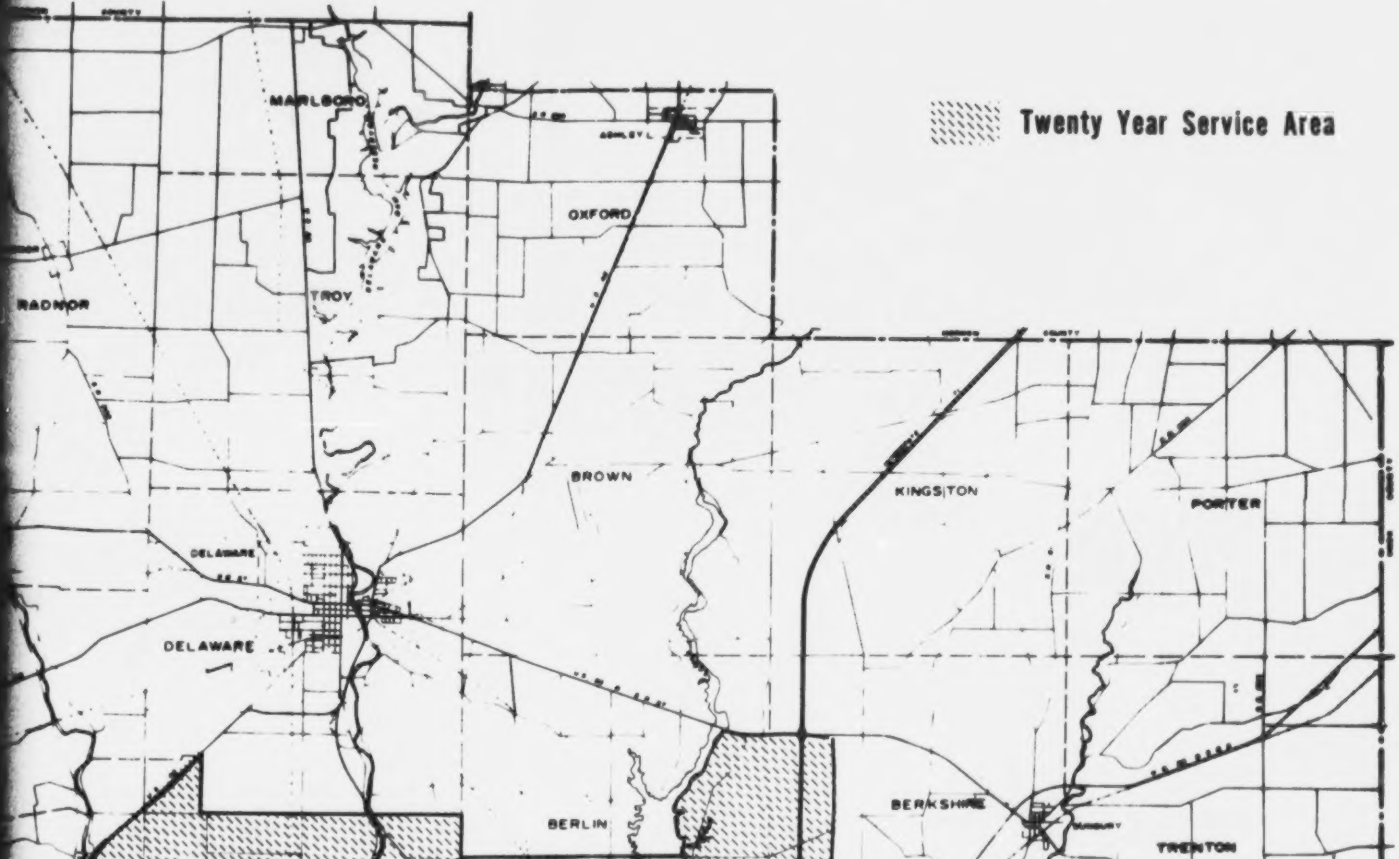
5 MILES

N

DELAWARE COUNTY,OHIO



NTY,OHIO


▨ Twenty Year Service Area
MARLBORO
ASHLEY
OXFORD
RADNOR
TROY
BROWN
KINGSTON
PORTER
DELAWARE
DELAWARE
BERLIN
BERKSHIRE
SUNBURY
TRENTON
CONCORD
LIBERTY
ORANGE
GENOA
HARLEM
POWELL
WESTERVILLE
FRANKLIN COUNTY
COLUMBUS

area it has experienced increasing residential growth and a decrease in working farms. Northern Franklin County has undergone more intense suburban development than has Delaware County. The planning area includes part or all of the townships of Scioto, Concord, Liberty, Berlin, Orange, Genoa, and Berkshire. Major communities in the area are Powell, and Shawnee Hills

D. Description of the Action Proposed in the Draft EIS

A sewage treatment plant of 1.5 MGD to be expanded to 3.0 MGD by the end of the 20 year planning period is to be constructed in South Central Delaware County, Ohio, between S.R. 315 and the Olentangy River, immediately above the county line (site OR-3). The two-stage activated sludge treatment facility includes phosphorus removal measures, tertiary rapid sand filters, and chlorination facilities. Sludge will be aerobically digested at the treatment plant and then hauled to a State-approved sanitary landfill site. The facility will discharge to the Olentangy River in Franklin County, below the I-270 interchange in the vicinity of Longfellow Avenue.

A new system of interceptor sewers will be constructed in three phases. Phase I, receiving immediate funding, will serve the Alum Creek Lake and Westerville Reservoir areas, Powell Road east of route 315, and the Village of Powell. Phase II extends to serve additional areas south of Alum Creek Lake. The south part of the O'Shaughnessy Reservoir on the Scioto River will be included at this time. Sewers will extend up to Home Road in the Olentangy basin. Phase III extends along Alum Creek Lake and adjacent areas, the Scioto basin, and the Olentangy basin, up to Delaware Township.

E. Water Quality and Quantity Problems in the Area

Regional water supply is obtained increasingly from streams and reservoirs because of quality and/or quantity limitations of the groundwater of this area. Reservoirs have been constructed on all of the major streams of Delaware County. Streamflow and flooding are regulated by these structures. Several existing treatment facilities discharge into area streams. Most soils of Delaware County have severe limitations for septic tanks and existing on-lot systems have resulted in nuisance conditions and degraded water quality.

F. Other Water Quality and Quantity Objectives

The Federal Water Pollution Control Act Amendments of 1972 (P.L.92-500) require:

a. Secondary treatment of wastes for municipal sewage and best practicable treatment for industrial discharges by July 1, 1977. b. Best practicable waste treatment technology for municipal wastes and best available treatment for industrial wastes by July 1, 1983. c. Issuance of permits for all point-sources discharges under the National Pollutant Discharge Elimination System (NPDES). The NPDES permit states the allowable waste loading and flow volume that can be discharged to a receiving stream or lake.

The National Flood Insurance Act of 1968 requires the designation of flood-prone areas in the United States and participation by appropriate communities and homeowners to qualify for national flood insurance protection. The designated communities who are participating in the program in southern

Delaware County include Powell, Galena, and Delaware. Shawnee Hills and Ostrander have been designated but are not participating in the flood insurance program. The unincorporated area of Delaware County has not been designated. In northern Franklin County, Columbus, Westerville, Worthington, Dublin, and also the unincorporated area have been designated and are participating in the flood insurance program. In the participating communities of both counties, although initial flood maps are available, detailed flood maps are not yet completed. Zoning will be required upon the completion of the detailed maps.

A 20 mile segment of the Olentangy has been designated as a State Scenic River, including the portion in southern Delaware County. Several species on the list of Ohio Endangered Wild Animals have been found in the Olentangy. The stream supports a diverse biological life and is a valuable natural and scientific resource.

Water-based recreation is popular in mid-Ohio and Delaware County is the site of several large parks, lakes, and high quality streams.

G. Costs and Financing

The cost for the construction of the Olentangy Environmental Control Center (1.5 MGD) and interceptors (Phase 1) was $11.05 million in January, 1975. Delaware County will be responsible for financing 25% of the project while 75% will come from Federal grants. Chapter 4 will discuss additional costs.

H. History of the Application

The following is a chronological listing of major steps and events in the processing of the grant application.

1964	"Comprehensive Master Plan, Delaware County, Ohio."
1969	"Delaware County Ohio Comprehensive Water and Sewerage Development Plan."
Jan. 1970	"Feasibility Survey and Report for Sanitary Service and Sewage Treatment Facilities."
July, 1970	Application for grant filed with Ohio Water Development Authority.
Sept. 1970	General plan and preliminary design for wastewater treatment plant submitted to State of Ohio Department of Health for approval at site north of Powell Road and other sites. Revised March, 1971. Approved April, 1971 by the State of Ohio.
Oct. 1970	County placed under permit by Ohio Water Pollution Control Board.
Oct. 1971	Location of treatment plant switched to east of Route #315, immediately north of the county line.
June, 1972	Ohio Water Pollution Control Board adopted orders restricting "on-lot disposal systems" and ordered County to file detailed plans and specifications for wastewater treatment works. Design of detailed plans initiated September, 1972.
Nov., 1972	Application for permit to construct submitted to Ohio EPA.
July, 1973	Havens and Emmerson report on treatment plant odors.
July, 1973	Detailed plans of Olentangy River - Powell Road Interceptor Sewer and Olentangy Environmental Control Center submitted to Ohio EPA. Environmental Assessment also submitted following interim procedures of April 3, 1973. Approval of detailed plans by Ohio EPA in November, 1973.
Aug., 1973	Mid-Ohio Regional Planning Commission A-95 review approval.
Aug., 1973	"Evaluation of the Proposed Olentangy Environmental Control Center" by Ohio EPA.

Aug., 1973	"Draft Preliminary Final Report on Compatability Factors of a Proposed Delaware County Sewage Treatment Plant with Highbanks Metropolitan Park," for the Metropolitan Park District of Columbus and Franklin County."
Aug., 1973	Olentangy designated as a State Scenic River.
Aug., 1973	Ohio EPA approved of site east of Route #315.
Sept., 1973	Initiated preliminary planning for Alum Creek Lake sewerage facilities.
Oct., 1973	"Policy Plan, Delaware County, 1970-1990" by Delaware County Regional Planning Commission.
Jan., 1974	Public hearing on proposed Olentangy treatment plant and interceptors.
Feb., 1974	Settlement agreement between Delaware County and Metropolitan Park District of Columbus and Franklin County regarding treatment plan site east of route #315.
April, 1974	Authorization by Delaware County for preparation of Facilities Plan.
May, 1974	Ohio Priority list approved by USEPA; Delaware County ranked #10.
June, 1974	Review of draft of "Facilities Plan" by Ohio EPA. Comments to the Applicant, July, 1974.
July, 1974	Draft "Facilities Plan" formally available; copies sent to U.S. EPA.
July, 1974	Public hearing on the Facilities Plan.
Aug., 1974	Project approved for funding by Mid-Ohio Regional Planning Commission and the State Clearinghouse.
Sept. 1974	Revised Facilities Plan submitted to Ohio EPA and USEPA.
Oct., 1974	Informal review of Facilities Plan by USEPA; additional information requested.
Jan., 1975	Ohio EPA certified the Facilities Plan to USEPA.
Jan., 1975	Additional information on the questions to the Facilities Plan received by USEPA.
March 19, 1975	Meeting with Delaware County officials and USEPA.

March 28, 1975	Delaware County filed a Step 3 grant application with Ohio EPA.
March 28, 1975	Notice of Intent to prepare an EIS issued by USEPA.
July 10, 1975	Step 3 grant application received by USEPA.
February, 1976	Draft Environmental Impact Statement distributed.
March 16, 1976	Public Hearing on the Draft EIS.
March 30, 1976	Deadline for comments on the Draft EIS.

CHAPTER 2
THE ENVIRONMENT WITHOUT THE PROPOSED ACTION

A. Topography

Delaware County is a part of the upper Scioto drainage basin. Disregarding the stream valleys, the county is almost a level plain, with gently rolling glacial moraines rising above this plain and some isolated gravel hills in the eastern part of the county. Ground elevations in the central and western portions of the county are around 950 feet above sea level and in the eastern part around 1,200 feet above sea level, all sloping slightly to the south.

This reasonably flat topography is one of the prime requirements for agriculture, housing or industrial development. The major streams and valleys are very important in the development of flood control, water supply and recreational programs. The Highbanks bluffs provide a valuable scenic resource in southern Delaware County.

B. Geology

1. Bedrock

The bedrock underlying Delaware County consists of a series of limestones, shales and some sandstones. The limestones include the Columbus, Delaware and Monroe Formations. Shales found within the county include the Bedford, Ohio, Olentangy and Sunbury Formations. Berea Sandstone and the Cuyahoga Formation, consisting of sandstone and sandy shales, complete the list of bedrock formations.

2. Surficial

Glaciers of the Illinoian and Wisconsin ages covered all of Delaware County, with the earlier Illinoian till being swept away by the more recent Wisconsin glaciers, about 23,000 years ago. The glacial till covers almost all of the bedrock, except in river valleys, where streams have cut through the till to expose the ancient bedrock. The glacial till in the western half of the county contains much limestone and dolomite and is highly calcareous. In the eastern half of the county, large amounts of sandstone and shale and smaller amounts of limestone and dolomite occurs in the moderately or slight calcareous till. Various land forms were deposited in Delaware County by the glacial outwash. The Powell End Moraine runs west to east through the southern part of Delaware County, across the village of Powell and Highbanks Park, and then northward to the east of Alum Creek.

C. Soils

The soil associations of Delaware County are presented in Figure 2-1. Each major soil association contains many soil series, some of which may have very contrasting characteristics to others within the association. The soil series are described and mapped in detail in the county Soil Survey, which should be consulted for descriptions of the soil associations and for site-specific information (U.S. Dept. of Interior, 1969).

The soils found in the county developed on glacial till or its alluvium. The various soils are a result of different parent materials from the till and underlying bedrock of limestone, shale, and sandstone, and of variations in natural drainage. The native vegetation was mixed hardwood forest.

About 86 percent of the terrestrial area of Delaware County is soils of the Soil Conservation Service's capability classes I and II. These areas may be considered to be prime agricultural land, having soils with either few, or slight and correctable limitations for farm use.

The most relevant soil characteristic in the development of sewerage facilities is the suitability of a particular soil for septic tank disposal field. This is dependent upon the permeability of the soil at the depth of the tile and below. A severe limitiation is imposed upon the suitability of a particular soil for such use by the presence of solid bedrock, a dense compact layer, or a layer of clay that interferes with adequate filtration and movement of the effluent from the soil. Conversely, in areas that are highly permeable, or where creviced or shattered bedrock is present near disposal field, care must be taken to avoid contaminating nearby groundwater supplies with the effluent. If the soil has a water table over the disposal field, or the area is subject to flooding, the system will not function regardless of the soil permeability.

The permeability of most soils in the county is relatively slow and septic tank disposal fields must be carefully installed. Septic tanks should not be concentrated on slowly permeable soils because they absorb effluents slowly and may become saturated in a short time. Of the soils found in the major soil associations, the Morley, Blount, Pewamo, Bennington, Alexandria, Cardington,

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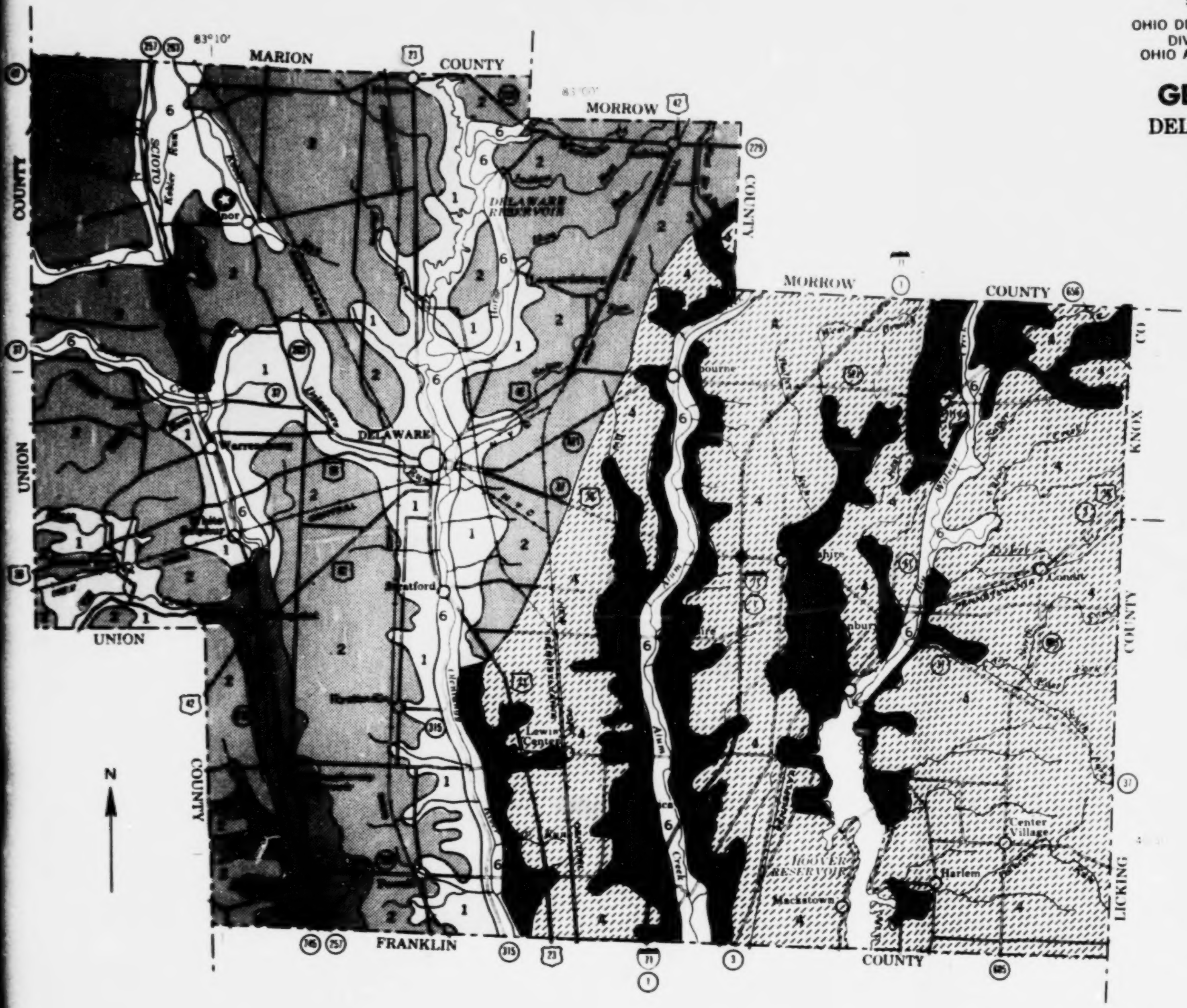


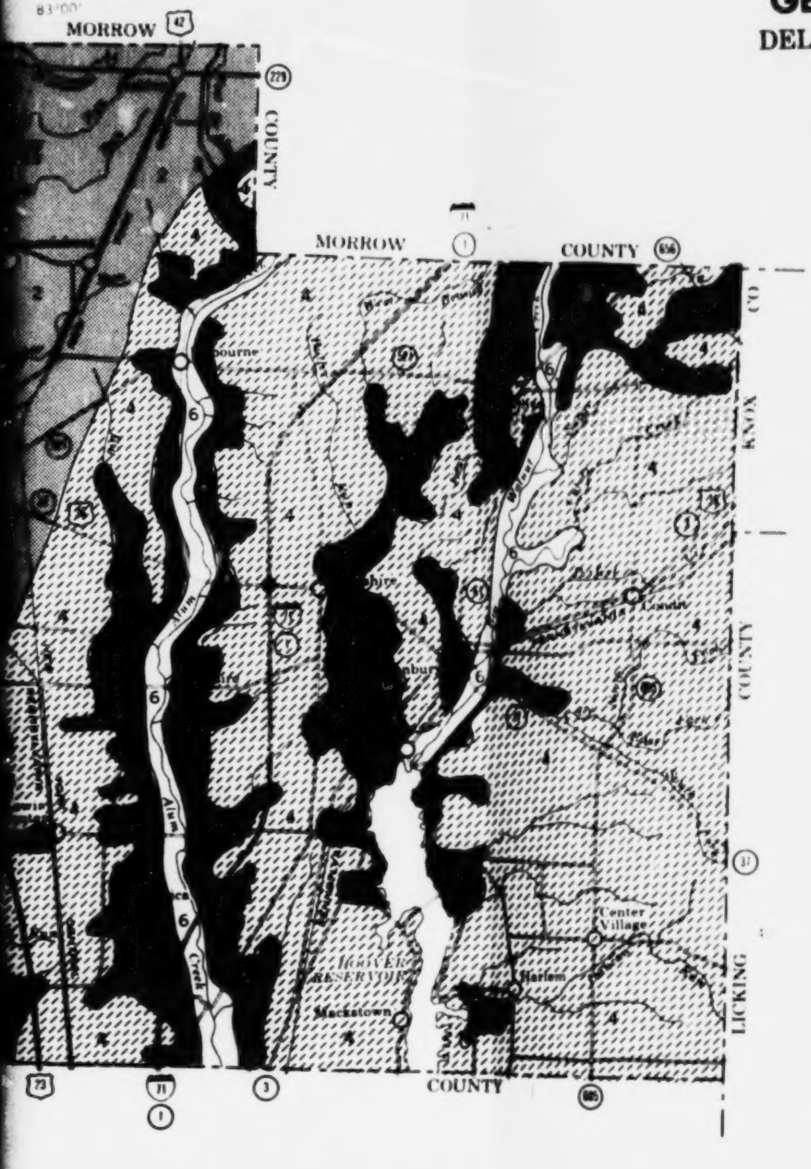


Figure 2-1.

Soil Associations

- 1 Morley-Blount
- 2 Blount-Pervamo
- ■ Cardington-Alexandria
- 4 Bennington-Pervamo-Cardington
- 5 Morley-Milton
- 6 Eel-Fox
- ✪ nearest land disposal site

and Milton soils are considered to have severe limitations for the use of septic tanks due to slow permeability and/or poor drainage, or shallow depth to bedrock, or steep slopes. Fox, Ockley, and Thackery soils are the only ones considered to have slight or moderate limitations. Though the majority of the soils are rated poor, comprising about 97% of the surface area of Delaware County, this rating does not imply that they cannot always be used for septic tank disposal fields. However, it does indicate that the limitations for such use are difficult to overcome and very careful planning and design are needed.

D. Groundwater

1. General

An underground water supply, whether for small domestic needs or for the large requirements of a city or industry, can only be obtained where geologic formations are present in such a manner as to transmit water. Formations that are capable of transmitting water are said to be permeable and are called aquifers. Generally, sand and gravel deposits are the most permeable and, consequently, the most important sources of underground water. Clay, silt, and shale are the least permeable.

The geologic formations which occur at, or near, the surface in the county comprise two general classes: (1) consolidated sedimentary layers of limestone, sandstone and shale, which form the bedrock, and (2) the unconsolidated glacial deposits of clay, sand and gravel. The Olentangy River is approximately the dividing line separating the limestone in the west half and the shales and sandstones in the east half of the county, and the state as well.

Figure 2-2 is a generalized map, prepared from Ohio Department of Natural Resources data, depicting potential underground water supplies and also presents the locations of a number of typical wells found throughout the county.

2. Water Quality and Quantity

The areas where wells yielding less than five gallons per minute can be developed consist mainly of thin to thick glacial drift, composed basically of clayey till, overlying shale. Where wells in these areas are finished in the limestone formations beneath the shale bedrock supplies may be developed, but due to the high degree of mineralization, quality is a deterrent to its use.

For most of the west half of the county, where yields of 100 to 500 gallons per minute can be developed, limestone is the prime aquifer. The glacial drift, though relatively thick, and ranging from thin lenses of sand and gravel interbedded in clay to thick layers of sand and gravel, seldom yields domestic supplies. For this area, it may be said that the quantity of underground water available increases with depth, but the mineralization also increases; hence, the quality may be a deterrent for a specific use.

The area along Alum Creek, where yields of 100 to 500 gallons per minute can be developed, consists of interbedded sand and gravel deposits underlying thick till beneath the Alum Creek valley, and yields may be as high as 200 gallons per minute.

Those areas in the county where yields of 5 to 25 gallons per minute can be developed mainly consist of thin to thick lenses of sand and gravel interbedded in clayey till, overlying sandstone or

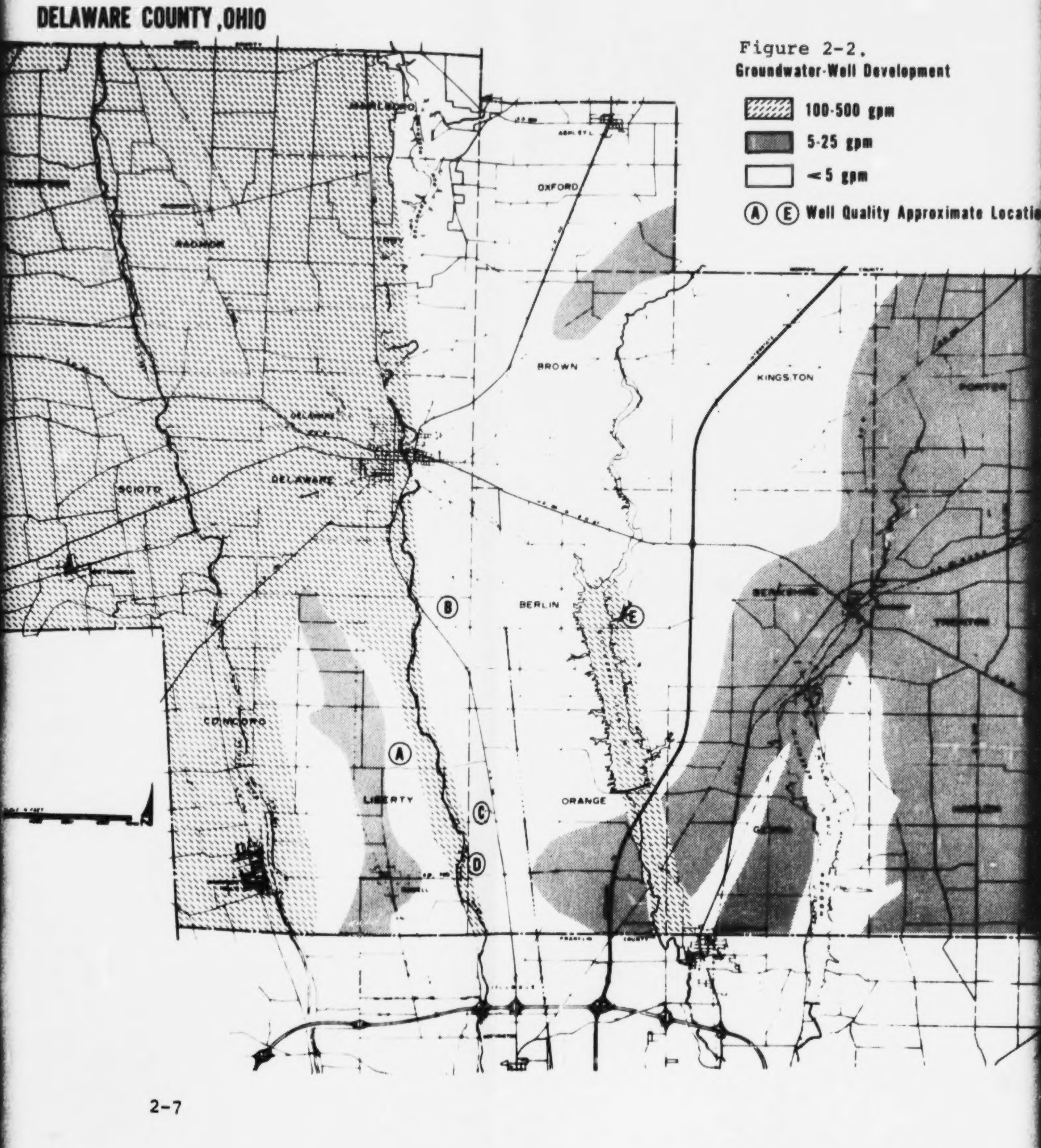
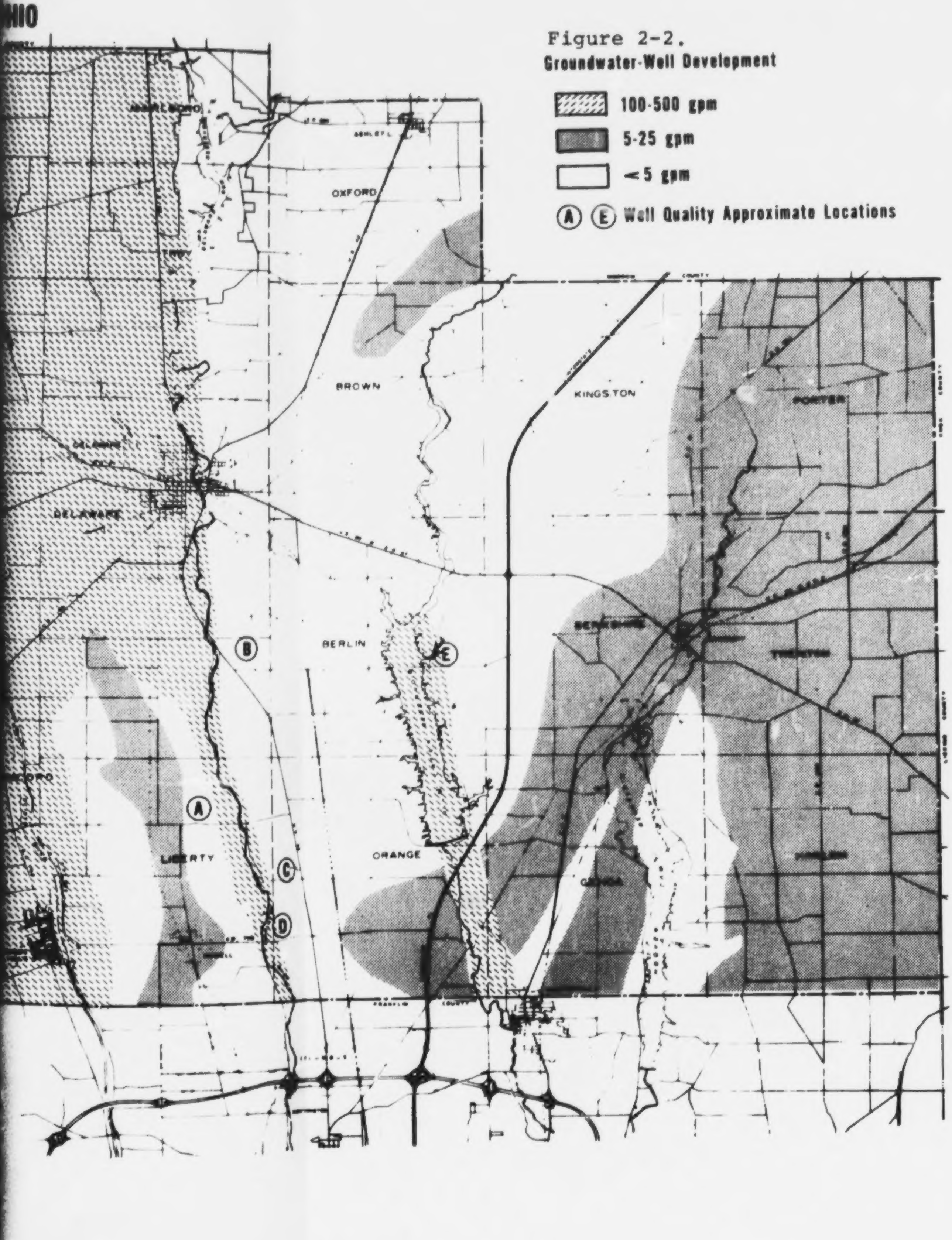


Figure 2-2.
Groundwater-Well Development

Figure 2-2.
Groundwater-Well Development



thin shale formations, with sandstone predominating east of Big Walnut Creek. Wells finished in sandstone have reportedly yielded as high as 70 gallons per minute, but the average yield is more likely to be less than 25 gallons per minute.

In an attempt to generalize the underground water resources in the county, it may be said that, using the Olentangy River as the dividing line, the east half of the county has quality but not quantity, the west half quantity but poor quality.

3. Water Quality and Quantity Problems

Iron levels may affect water taste, spot laundered clothes, and stain plumbing fixtures. Not more than 0.3 mg/l of soluble iron is recommended for public water supply sources in EPA's Water Quality Criteria 1972. Some of the well levels exceed this in Delaware County, as listed in Table 2-1 .

The 1972 criteria recommend that sulfate be less than 250 mg/l to avoid problems with taste and with laxative effects to those not accustomed to high sulfate levels. Some wells exceed this recommendation.

Taste problems also occur with high levels of chlorides in drinking water. A maximum of 250 mg/l is set in the 1972 criteria. One well listed sharply exceeds this level.

Table 2-1

DELAWARE COUNTY

GROUND WATER QUALITY

(For locations, see Figure 2-2)

	Fe mg/l	SO4 mg/l	Cl mg/l	Dissolved Solids mg/l	CaCO3 mg/l
A 27 ft. deep Gravel	1.3	125	7.2	571	432
B 125 ft. deep Limestone	.2- 3.6	878 - 928	42- 45	1,720- 1,780	1,210- 1,280
C 305 ft. deep Limestone	.26	1,630	18	2,840	2,010
D 36 ft. deep Gravel	.11	70	4.0	407	374
E 494 ft. deep Limestone	8.8	22	9,330	16,000	4,100

Dissolved solids include various specific substances as chloride and sulfate, so high levels would have the undesirable aspects of their component substances. The 1962 Public Health Service Drinking Water Standards recommend a limit of 500 mg/l for total dissolved solids (TDS). Well water samples of Table 2-1 generally exceed this recommendation.

Groundwater in the county tends to be hard, as reflected in the high calcium carbonate values. Households utilizing well water often have water softeners to correct this problem. Malfunctioning on-lot sewage systems have the potential to pollute groundwater, particularly in the shallow gravel aquifers. About one-third to one-quarter of the population of south central Delaware County is presently served by well water. Water softening costs and increasing power costs for well pumping are making groundwater wells a less attractive water supply alternative for home use than the Del-Co water company's surface water supply.

4. Water Uses

Groundwater is used for domestic and farm purposes, although surface water is becoming more popular for domestic use. Extensive industrial water consumption has not been possible in central Ohio, due to limited water supplies. Southern Delaware County has only slight industrial development of any kind at the present time. Water quality and quantity problems would limit the value of the local groundwater for extensive industrial use. Within Franklin County, only about 10 percent of the municipal water supply comes from groundwater.

E. Surface Water

1. General

Four south-flowing streams, the Scioto River, Olentangy River, Alum Creek, and Big Walnut Creek cross Delaware County in nearly parallel north-south courses, with the last three being tributaries to the Scioto. Big Walnut Creek is not within the service area of this project.

Delaware Lake, on the Olentangy River, and Alum Creek Lake on Alum Creek are federally owned and operated for flood control, recreation, water supply (taken only on an emergency basis from the Delaware Lake), and allied purposes. Recreation areas are operated by the Ohio Department of Natural Resources. Hoover Reservoir, on Big Walnut Creek, and O'Shaughnessy Reservoir, on the Scioto River, are owned by the City of Columbus and provide water supply storage. These water bodies are shown in Figure 1-1 and additional information is provided in Table 2-2. Delaware County has several ponds created in old borrow pits, but no major natural lakes.

The Scioto and the Olentangy Rivers are considered navigable by the U.S. Army Corps of Engineers, but traffic is limited to pleasure craft. The Olentangy River has been designated a State Scenic River from the Delaware Dam (in northern Delaware County) to Wilson Bridge Road (in northern Franklin County).

Table 2-2.

RESERVOIRS

Reservoir	In Operation Since	Stream	Drainage Area (sq.mi.)	Storage Capacity (acre-ft) Total	Storage Capacity (acre-ft) Usable	Primary Purpose 1/
Delaware	1951	Olentangy R.	386	132,000	24,500	**Flood Control**
Griggs	1905	Scioto R.	1044	4,450	3,700	**Water Supply**
O'Shaughnessy	1924	Scioto R.	979	16,980	14,500	**Water Supply**
Alum Creek	1975	Alum Crk.	123	133,200		**Water Supply & Flood Control**
Hoover	1955	Big Walnut Crk.	190	86,090	60,130	**Water Supply & Flood Control**

1/ Most of the existing reservoirs are used also for recreation.

2. Water Quantity

Appendix B lists the U.S.G.S. stream gaging records for area streams for the water year 1974, (Note: To convert cfs to MGD, multiply by 0.646; to convert MGD to cfs, multiply by 1.55). Flow in all of the major streams of the service area is regulated by artificial lakes and dams (Figure 1-1).

Discharge to the Olentangy River from Delaware Lake is regulated as follows during low flow periods:

Table 2-3 Olentangy Discharge

Period	Scheduled Discharge
1-10 July	10 c.f.s.
11-20 July	25
21-31 July	35
1-20 August	40
21-31 August	35
1 September-31 October	20
Minimum Release	5

Source: U.S. Army Corps of Engineers 7/31/75 (Appendix J).

Low-flow discharges as listed above are released from storage when inflows are insufficient to maintain the required flows. For other periods of the year normal inflow is released back to the river, with the guaranteed minimum release being 5 cfs. Summer flows may be less than stated in Figure 2-3, if the higher releases are not possible. U.S.G.S. stream gaging records have been used to analyze low flow values (see letter, Appendix J). Extreme low flow on the Olentangy River prior to the construction of Delaware Dam, the historical natural 7-day, once in 10-year low flow, was 0.9 cfs at the Stratford gage and an estimated 1.0 cfs at the Delaware-Franklin County line. U.S.G.S. stream gage records, since the advent of Delaware Dam, indicate that the low flow value, the historical modified 7-day, once in 10-year flow, was 10.2 cfs at the Worthington gage (the Stratford station having been discontinued), and an estimated 9.7 cfs upstream at the Delaware-Franklin County line. For planning purposes in this EIS, a low flow value is being used in this document to reflect the present minimum release of 5.0 cfs. This results in the adjusted minimum release 7-day, once in 10-year low flow, 4.73 cfs at the Delaware-Franklin County line, developed in Figure 5-1. Although the historicial modified low flow values have been higher than this since the river has been regulated, the adjusted minimum release flow value is all that can be assured by the present regulation schedule. The average stream flow of the Olentangy at the Worthington gage is 441 cfs for the published period of record, 1955 to 1974.

Increasing the minimum release of Delaware Dam from 5 cfs would involve modifying the use of Delaware Lake. The draw-down to increase the assured minimum release to 10 cfs would infringe upon the sediment reserve capacity and adversely affect recreation usage. Increasing the flow beyond 10 cfs would impact recreation uses more severely and reduce flood control capability. The studies required for any flow increase would take about nine months, and funds from the U.S. Army Corps of Engineers are not presently available for this purpose. EPA cannot use its funds for sewage treatment facilities for this purpose. If the stated purposes of Delaware Lake, such as flood control and recreation, are adversely affected, authorization by Congress would be required.

A letter from the Huntington District of the Corps of Engineers, in Appendix J, explains the flow augmentation requirements, and also discusses the problems of building an additional reservoir to augment low flows. Flow on Alum Creek at Africa Road was unmeasurably low at times in 1963-65. Regulation by the dam and Alum Creek Lake will augment these extreme low flow conditions by providing the 5 cfs minimum release.

3. Water Quality

Water quality data for Delaware County are available from several sources. Each is based on a limited number of samples. The following is a summary of data collected at water supply intakes:

Table 2-4.

SURFACE WATER QUALITY
Delaware County, Ohio

	Sunbury Big Walnut Creek	Delaware Olentangy River	Westerville Alum Creek
Turbidity Units	0	30	35
Color Units	7	13	3
Total Solids	286	422	584
Total Alkalinity as $CaCO_3$	125	140	244
Total Hardness as $CaCO_3$	212	228	424
pH	7.5	7.7	7.8
Calcium as $CaCO_3$	4	-	-
Magnesium as Mg	19	9	50
Sodium as Na	14	17	54
Total Iron as Fe	0.1	1.2	1.1
Manganese as Mn	0	0	0
Sulfates as SO_4	40	75	-
Nitrates as NO_3	-	17.1	2.5
Chlorides as Cl	26	28	70
Fluorides as Fl	0.2	0.2	0.3

(All units in milligrams per liter except turbidity, color, and pH).

flow value, the historical modified 7-day, once in 10-year flow, was 10.2 cfs at the Worthington gage (the Stratford station having been discontinued), and an estimated 9.7 cfs upstream at the Delaware-Franklin County line. For planning purposes in this EIS, a low flow value is being used in this document to reflect the present minimum release of 5.0 cfs. This results in the adjusted minimum release 7-day, once in 10-year low flow, 4.73 cfs at the Delaware-Franklin County line, developed in Figure 5-1. Although the historicial modified low flow values have been higher than this since the river has been regulated, the adjusted minimum release flow value is all that can be assured by the present regulation schedule. The average stream flow of the Olentangy at the Worthington gage is 441 cfs for the published period of record, 1955 to 1974.

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Color Units	7	13	3
Total Solids	286	422	584
Total Alkalinity as $CaCO_3$	125	140	244
Total Hardness as $CaCO_3$	212	228	424
pH	7.5	7.7	7.8
Calcium as $CaCO_3$	4	-	-
Magnesium as Mg	19	9	50
Sodium as Na	14	17	54
Total Iron as Fe	0.1	1.2	1.1
Manganese as Mn	0	0	0
Sulfates as SO_4	40	75	-
Nitrates as NO_3	-	17.1	2.5
Chlorides as Cl	26	28	70
Fluorides as Fl	0.2	0.2	0.3

(All units in milligrams per liter except turbidity, color, and pH).

A summary of water quality sampling on the Olentangy River is shown in Table 2-5. This also includes water quality standards for certain parameters. Note that improvements of the sewage treatment facilities upstream in the City of Delaware has occurred subsequent to some of these records and this is anticipated to lead to better effluent quality. Additional water quality records for the Olentangy River and Alum Creek can be found in Appendix B. Quality of the water on these streams within Franklin County tends to be higher upstream and decreases downstream, as a result pollution from the Columbus urban area. Appendix B includes water quality data for selected stations on the Scioto River.

4. Water Quality and Quantity Problems

The Scioto Basin Report prepared by Ohio EPA indicates that standards for fecal coliform bacteria are violated in the Olentangy River. This is indicative of problems both with municipal sewage treatment and septic tank malfunctioning, with subsequent stream contamination.

Overloaded sewage treatment facilities were present at the City of Delaware prior to the rebuilding of their 2.5 MGD treatment plant, completed in December of 1974. Much of the existing water quality data reflect these old conditions. The new facility should improve water quality but the system has been prone to frequent upsets from industrial wastes, leading to less effective treatment than its design capabilities. Presently, applications are being made for additional phosphorus removal, ammonia removal, and control of the upsets. Downstream

Table 2-5. Water Quality of Olentangy River

Data Source	Burgess & Niple, Ltd.	Ohio Wesleyan Study Team	Scioto River Basin: Waste Load Allocation Report	John H. Olive	Water Quality Standards for The River Segment
River Reaches Measured from the Proposed Site (miles	0-2.5	-22-1.	Delaware Dam to Mouth	6-47	Delaware Dam to Mouth
Conditions	Existing	Before the Expansion of the Delaware STP	Before the Expansion of the Delaware STP	Before the Expansion of the Delaware STP	Existing
No. of Observations	24	N.A.	13	13	---
Dates of Observations	10/31, 11/7, 11/25/74	6/13/72-7/28/72	before 3/1/74	Summer 1967-1969	---
DO in mg/l	7.4-12.4	4.3-6.7*	a. 4.3-7.4** b. 7.4-16	6.9-8.8	5.0
BOD$_5$ in mg/l	1.3-12.7	---	a. 2.5-13.2 b. 2.3-4.8	---	---
NH$_3$ as N in mg/l	0.0-1.7	---	a. 0.1-3.75 b. 0.0-0.1	---	1.5
NO$_3$ as N in mg/l	0.0-0.9	0.4-4.0	a. 2.1-2.8 b. 2.1-2.8	---	8.0
Organic N in mg/l	0.0-3.4	---	a. 0.25-6.1 b. 0.5	---	---
Total P in mg/l	0.11-1.16	---	a. 0.0-0.3 b. 0.0-0.3	0.32-2.13	---
Temp. in °C	4.5-20.0	17.5-28	a. 25.0 b. 19-28	21-24	See Table 46
pH	7.6-8.1	6.8-8.4	a. 7.9-8.7 b. 7.9-8.7	8.3-8.5	6.0-9.0
Total Coliforms in 100 ml	---	800-2.4x10^4*	---	---	---
Fecal Coliforms in 100 ml	66-44x10^5	5.6-1205*	a. 530-tntc*** b. 530-tntc***	---	200
Fecal Streptococci in 100 ml	26-6.8x10^4	---	---	---	---
T.S.S. in mg/l	6-65	---	---	---	---
T.D.S. in mg/l	---	---	a. 274-394 b. 274-394	---	500
Cl$^-$ in mg/l	40.4-73.2	---	a. 24-50 b. 24-50	32-43	250
Fe (dissolved) in μg/l	---	---	a. 200-300 b. 200-300	---	1,000
Cd in μg/l	<1	---	---	---	5
Cr in μg/l	<2-31	---	a. 0.0 b. 0.0	---	100
Zn in μg/l	<20-80	---	---	---	1,000
Mg in mg/l	---	---	a. 17 b. 17	56-86	---
Cu in μg/l	<25-58	---	---	---	500
Cyanide in μg/l	<3-8	---	---	---	200
Turbidity in JTU	7-43	---	---	---	---
Turbidity in ppm	---	---	---	29-156	---

*Only one observation per sampling location

**With one low value of 1.4 mg/l of D.O. at Station 5 between the Delaware STP's Sanitary Land Fill and Quarry

***Too numerous to count

a. During low flow periods

b. Other than low flow periods

Source: Enviro Control, 1975

in Franklin County, the Worthington Hills treatment plant is a small, overloaded facility, (design capacity, 280,000 gallons per day) which is scheduled to be phased out in 1977 via the conditions of its discharge permit.

The septic tank ordinance which Delaware County enacted in 1974 provides for systems on one-acre minimum lots. This should help to have better functioning systems, with proper enforcement. The soils of the county still have general limitations for this type of system. Small package treatment plants must be properly maintained and operated to be effective at preventing water pollution.

The Olentangy and Scioto Rivers and Alum Creek are all water quality limited stream segments in Delaware County. The Scioto Basin Report lists point discharges in the area. Nonpoint sources of pollution, such as stormwater and agricultural runoff may also adversely affect area streams. The Basin Report also contains waste load allocations for these streams.

Low flows can be a problem in streams because of increased concentrations of the various pollutants. A diagram of water uses and discharges under low flow conditions for the Olentangy River is shown in Figure 5-1.

During low flow in the Scioto River, polluted conditions exist as far as 50 miles downstream from Columbus. With Best Available Treatment (as defined by Ohio EPA) pollution would be expected to extend to about 13 miles below the Jackson Pike Treatment Plant. Stream degradation takes the forms of oxygen depletion, and excessive levels of fecal coliform bacteria, ammonia, fluorides, and some heavy metals (cadmium, zinc, lead, iron), (Ohio EPA, 1975). Upstream conditions in the tributaries to the Scioto within Franklin County do improve, but high levels of fecal coliforms and low dissolved oxygen levels present problems in Alum Creek, and high levels of nutrients and fecal coliforms occur in the Olentangy River.

The final report of the National Eutrophication Survey indicate that the O'Shaughnessy Reservoir is eutrophic, and ranks last in trophic quality among the 20 Ohio lakes sampled in 1973 for a combination of six parameters (EPA, 1975-c). The preliminary report for Delaware Lake also indicates eutrophication for that reservoir, which ranks 14th out of the 20 lakes studied (EPA, 1975-a). Hoover Reservoir likewise is eutrophic, and ranks fifth in the overall trophic quality of the 20 lakes (EPA, 1975-b).

5. Water Uses

Surface water is an important recreational resource in Delaware County. Stream corridors and the numerous impoundments provide extensive water-based recreation for the region. Pleasure craft utilize the Scioto and Olentangy Rivers. The Olentangy has been designated a State Scenic River for 20 miles in southern Delaware and Northern Franklin Counties. Wildlife and aquatic biota utilize the surface water bodies and the streams are classified as a warm-water fishery.

Water for human consumption is provided from the Hoover and O'Shaughnessy Reservoirs, which are owned by the City of Columbus. Delaware Lake is Federally owned, but is providing only an emergency water supply. Federally owned Alum Creek Lake will provide water for the Columbus area. An emergency water supply intake for Columbus is located at the mouth of the Olentangy River, but has yet to be utilized. Southern Delaware County receives over half of its water supply from surface waters, via the Del-Co Water Company. Water is withdrawn from the Olentangy River north of Home Road and is piped throughout the southern part of the county. A future water storage tank will help to reduce withdrawals from the stream during periods of low streamflow. Most of this water is for domestic use in southern Delaware County, as there is very little industrial development, and many farmers use the lower quality but cheaper groundwater for farming purposes. Alum Creek provides part of the water supply for the City of Westerville, to supplement the city's small reservoir. About 90 percent of Franklin County's municipal water supply comes from surface water sources.

Existing sewage treatment plants are located at Delaware, on the Olentangy; at Worthington Hills, on the Olentangy (to be phased out by 1977); and at Columbus (Jackson Pike and Southerly) on the Scioto. These points are shown in Figure 1-1.

6. Water Quality Management

Section 208 of the Federal Water Pollution Control Act Amendments of 1972 provides for areawide planning for waste treatment management in large urban-industrial areas, or other areas of the nation which have severe and complex water quality problems. The Governor of Ohio has submitted a proposal for USEPA approval. Section 208 planning would be done for Franklin

County and the surrounding tier of townships by the Ohio EPA. Part of the planning work would be sub-contracted to the Mid-Ohio Regional Planning Commission. As of May, 1976 this proposal has not yet been approved.

The Ohio Environmental Protection Agency has the responsibility for implementing Section 303 of the 1972 Amendments whereby water quality problems are identified and overall pollution abatement strategies are established for all major river basins in the state. The Scioto River Basin Waste Load Allocation Report is a part of the 303(e) Continuing Planning Process, and includes all area streams.

A Title 10 grant by the Department of Commerce is presently being used to study the Scioto River.

7. Flood Hazards

Flooding in the project area has been largely eliminated through the construction of reservoirs on all major streams and their resulting regulation. The natural occurrence of flooding is greatly reduced for all but the most extreme and highly improbable storms.

The Delaware County treatment facility and lift stations will be built above the calculated historical 100 yr. flood plain, however, some of the landscaping for the facility will occur in the flood plain.

F. Biology

1. Plant Communities

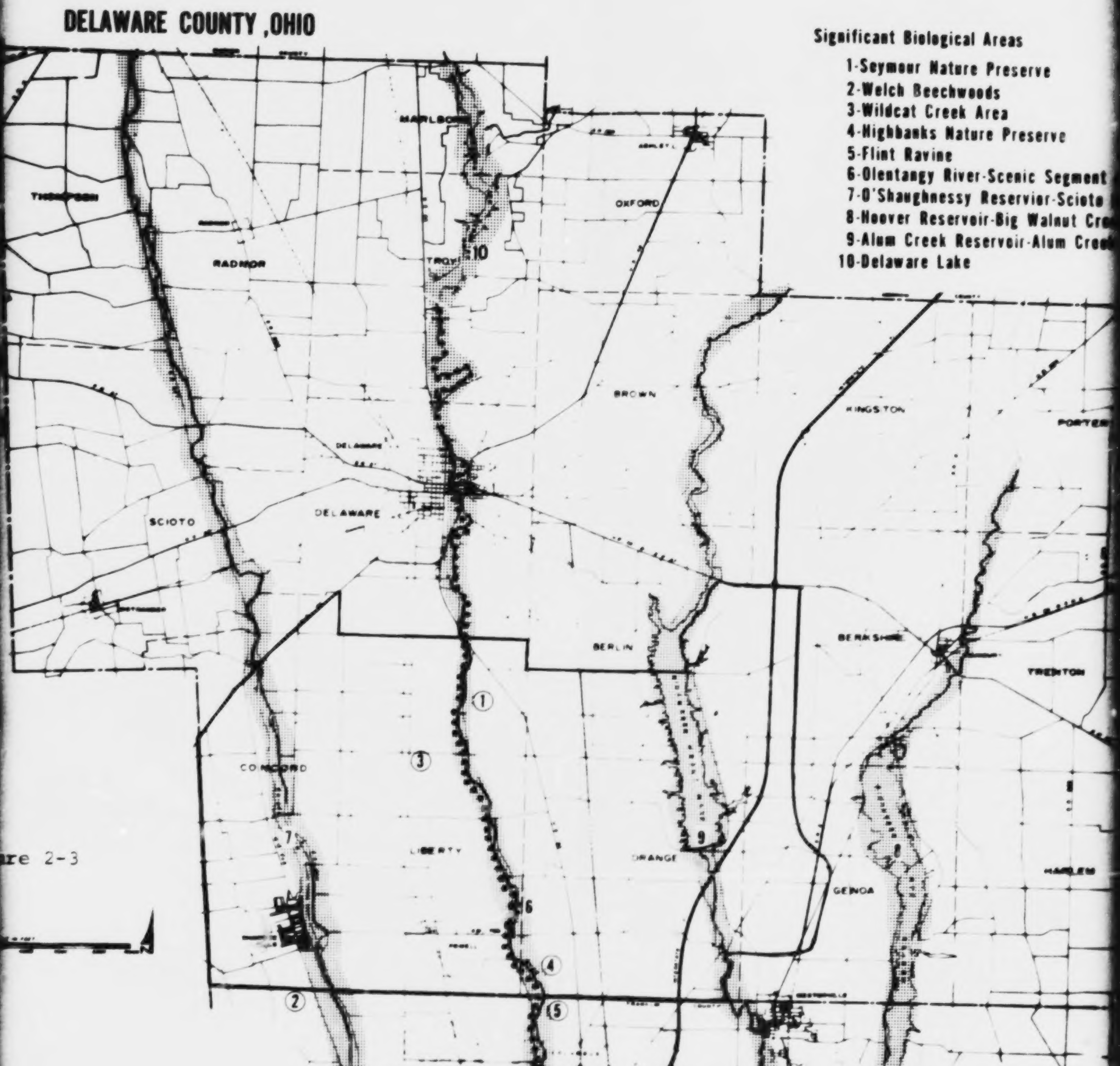
The original vegetation of Delaware County was forest, largely removed by early settlers for farming. The Beech-Maple association predominates, especially on moraines, although there are also some Oak-Hickory forests. Along the rivers the Sycamore-Cottonwood-Box Elder association is found. Quite a bit of osage orange was planted as hedge rows by farmers.

Several significant plant areas have been identified within Delaware County, some of which have been declared Natural Areas or Nature Preserves by the Ohio Department of Natural Resources, (Figure 2-3). No known survey of the aquatic plants of Delaware County has been undertaken.

The Seymour Nature Preserve is located in the Olentangy River drainage basin, south of the City of Delaware and north of Winter Road. This preserve is considered a good second growth Oak-Hickory area. This acreage has been donated to the State of Ohio.

The Welch Beechwoods area is located in the Scioto River drainage basin south of the O'Shaughnessy Dam with the majority of the area lying in Franklin County. This Beech-Maple forest contains large three foot diameter beech trees.

The Wildcat Creek area is located in the Olentangy River drainage basin in the vicinity of Home Road. This is a privately owned area containing a mixed mesophytic community, with beech, maple and oak. It also contains a rich herbaceous flora in a scenic ravine with a stream and pond.


DELAWARE COUNTY ,OHIO
Significant Biological Areas
1-Seymour Nature Preserve
2-Welch Beechwoods
3-Wildcat Creek Area
4-Highbanks Nature Preserve
5-Flint Ravine
6-Olentangy River-Scenic Segment
7-O'Shaughnessy Reservior-Scioto
8-Hoover Reservoir-Big Walnut Cre
9-Alum Creek Reservoir-Alum Cree
10-Delaware Lake
THOMPSON
RADNOR
MARLBORO
TROY
OXFORD
BROWN
KINGSTON
PORTER
DELAWARE
SCIOTO
BERLIN
BERKSHIRE
TRENTON
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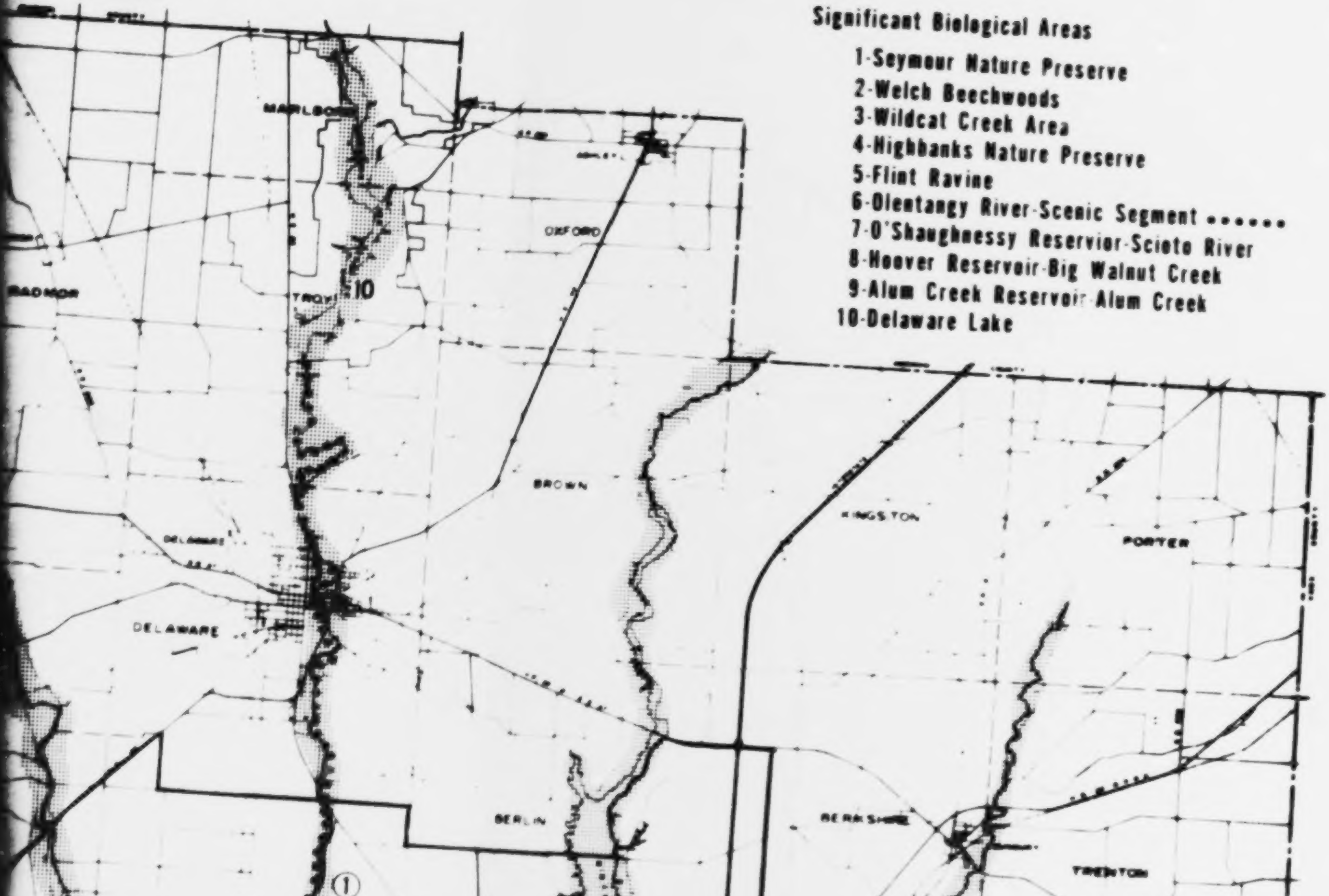


Significant Biological Areas

1-Seymour Nature Preserve
2-Welch Beechwoods
3-Wildcat Creek Area
4-Highbanks Nature Preserve
5-Flint Ravine
6-Olentangy River-Scenic Segment • • • • • •
7-O'Shaughnessy Reservior-Scioto River
8-Hoover Reservoir-Big Walnut Creek
9-Alum Creek Reservoir-Alum Creek
10-Delaware Lake

The Highbanks Nature Preserve, encompassing an area of over 200 acres, is located entirely within the Highbanks Metropolitan Park. The majority of the park lies within Delaware County, just north of the Delaware-Franklin County line between U.S. Route 23 and the Olentangy River. The area remains in good natural condition. Appendix C lists the plants of Highbanks Park and the wildflowers of the park which appear on the Ohio Endangered Species list. This park is considered to have Statewide significance as a natural area.

Flint Ravine south of Highbanks Park in northern Franklin County has been essentially maintained in its wild state and has been identified as a noteworthy natural area by the Ohio Biological Survey.

2. Terrestrial Animals

Farmland, woodlots, natural area parks, and streamside areas provide the principal habitats for wildlife in the area. The valuable plant areas just discussed above would also have significance as wildlife habitat.

In Delaware County one would expect to find small animals such as squirrels, rabbits, foxes, wood chucks, raccoons, skunk, weasels, mink, opossums and muskrats. Deer also occur in central Ohio. A variety of game birds, water birds, birds of prey, and woodland and field birds live in the county, as well as reptiles and amphibians. Appendix C lists the terrestrial animals and some birds of Franklin County. The animals and birds of Highbanks Park are also listed in Appendix C.

Bald eagles are occasionally observed as transient visitors to Delaware County, although the species has not nested there within memory. Most of those observed are immature birds, who are found aroung the area's streams and Delaware Lake (Good, 1976). An immature eagle was noted for over two weeks in February, 1976 at the Delaware Lake wildlife area (Ohio Biological Survey, 1976). Above 40° N. latitude, which runs through Columbus, the northern subspecies of bald eagles is found. The southern subspecies is designated as occurring south of 40° N. latitude. It is the southern subspecies, Haliaeetus leucocephalus leucocephalas, which is on the United States List of Endangered Fauna. Both subspecies are on the Ohio List of Endangered Wild Animals.

3. Aquatic Animals

The O'Shaughnessy Reservoir is located on the Scioto River in southwestern Delaware County. This 1,000 acre reservoir supports large mouth bass, crappies, several catfish species, bluegill sunfish, and green sunfish (Strom, 1976). Appendix C lists migratory waterfowl observed here.

Hoover Reservoir is located on Big Walnut Creek in Delaware and Franklin Counties and contains approximately 3,300 acres of impounded water. It is much used for fishing and contains walleye pike, white bass, two crappie species, muskellunge, bluegill sunfish, large mouth bass, and three species of catfish. (Strom, 1976).

The borrow pits located in Delaware County can be considered as having fish species similar to those for all borrow pit ponds surveyed statewide. Thirty-four species were found to inhabit borrow pit ponds when surveyed on a statewide basis. Bluegill sunfish and large mouth bass were the most common species represented.

The Scioto River in Delaware County supports a diverse biological community. North of the City of Columbus the stream is moderately degraded, while downstream from the city the Scioto River has a greatly reduced biological diversity, limited mostly to pollution-tolerant organisms, a few species occurring in great numbers. Diversity and pollution is discussed in Appendix C, "Aquatic Organisms and Pollution".

Alum Creek has supported a variety of fish and mollusks, as presented in Appendex C. The ecology of Alum Creek has been altered recently by the flooding of the Alum Creek Lake early in 1975. Within the impoundment changes in the numbers of species and kinds of species will occur, but no known studies have been conducted yet on the new lake. The Environmental Impact Statement prepared for the Alum Creek Lake project in 1972 by the U.S. Army Corps of Engineers predicted that 19 of the fish species would be able to live only in streams, while 32 fish species could continue to live in the new lake habitat. Game fishes expected to flourish in the lake would include white and black crappie, large mouth black bass, bluegill sunfish, bullhead catfishes, and various sunfishes. The lake has been stocked with bluegill sunfish, crappies, walleye pike, and large mouth bass. (Strom, 1976). Carp and gizzard shad would also inhabit the lake, as would some minnow species.

Only 3 or 4 of the 27 known naiad mollusks of Alum Creek are expected to be able to survive in the impoundment. Other kinds of benthic (bottom-dwelling) invertebrates were studied prior to reservoir construction (Olive, 1971). The effect of impoundment on these animals has not been estimated, but species composition may be expected to change.

The Olentangy River has regional to national significance as a valuable biological resource. It has been designated as a State Scenic River between the Delaware Reservoir and the Wilson Bridge Road at Worthington (Franklin Co.) in 1973.

The aquatic insects of the Olentangy have been inventoried, as well (Olive, 1971; Olive and Smith, 1975). The sampling station just above the Delaware-Franklin County line for freshwater invertebrates has a relatively high species diversity. About 70 percent of the sampled benthic invertebrates are considered pollution sensitive organisms. Of the clean-water indicator species that were collected, caddisflies, stoneflies, and mayflies were included. Pollution-tolerant oligochaetes were also collected and accounted for an average of 27 percent of the benthic invertebrates. The high diversity of kinds of species present indicates a healthy stream condition, despite the presence of the oligochaetes.

The Olentangy is a healthy, attractive stream supporting a diverse biological life, providing a recreational resource as well as a site for ecological study. Artificial lake construction and urbanization have altered most of the regional stream corridors of the area, adding to the uniqueness of this portion of the Olentangy. Appendix J contains letters with additional biological information on the stream.

G. Air Quality

Delaware County has been identified as having attained the National Ambient Air Quality Standards for total suspended particulates (TSP), sulfur dioxide (SO_2) and carbon monoxide (CO).

The Ohio EPA has established ten air quality monitoring stations in Franklin County. Data collected from several of these stations for particulates, sulfur dioxide, and nitrogen dioxide is summarized in Table 2-6. State standards for particulates require that the annual geometric mean not exceed 60 micrograms per cubic meter ($\mu g/m^3$), and that the 24-hour concentration not exceed 150$\mu g/m^3$ more than once per year. In the absence of data representing the annual geometric mean for particulates, Table 2-6 includes the arithmetic average for 1974. Arithmetic means are generally somewhat higher than geometric means. Thus, this data cannot be thoroughly evaluated in terms of its exact relation to maximum standard values. However, in the absence of data given in terms of geometric means the data can be used for a general view of particulate levels in this area.

Regarding levels over a 24-hour period, an examination of daily data indicates that of 20 to 212 days sampled at various stations from April 1974 to February 1975, 0 to 18 days (the number of days varying at different stations) had concentrations of particulates in excess of maximum standard

Table 2-6.

Air Quality Data - Franklin County

Suspended Particulates ($\mu g/m^3$)

	1974	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Years Avg.
1.	181 S. Washington	87	87	90	95	85	87	132	98	97	122	73	75	94
2.	330 E. Dominion Ave.	70	66	66	76	74	75	88	93	62	86	58	54	72
3.	1113 Chesapeake Ave.	74	80	65	90	65	87	108	104	80	85	86	59	82
4.	1595 Morse Road	109	131	83	92*	87	90	112	124	97	88	88	61	97
5.	4th Street & East Naghten	99	119	123	136	113	116	176	138	108	141	95	73	120
6.	303 East 6th Ave.	-	-	110	116	77	119	134	146	104	141	90	65	110
7.	East 11th Ave.	-	-	-	170	128	124	163	142	126	133	113	57	128
8.	Merullo's Nursery 1780 Windsor Ave.	-	-	-	-	-	-	-	-	82	75	82	48	72
	Month Average	88	97	90	111	90	100	130	121	95	109	86	64	98

Nitrogen Dioxide ($\mu g/m^3$)

	1974	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.-1975	Avg.
1.	181 S. Washington	40	50	58	48	73	56	51	-	50	49	56	53
2.	East 11th Ave.	36	48	49	-	63	49	54	-	49	47	45	49
3.	Merullo's Nursery 1780 Windsor Ave.	-	-	-	-	-	44	45	-	43	43	41	43
	Month Average	38	49	54	48	68	50	50	-	47	46	47	50

Sulphur Dioxide ($\mu g/m^3$)

	1974	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.-1975	Avg.
1.	181 S. Washington	11	10	24	38	38	44	35	-	45	28	41	31
2.	East 11th Ave.	14	51	19	38	33	39	31	-	21	40	33	32
3.	Merullo's Nursery 1780 Windsor Ave.	-	-	-	-	-	-	27	-	28	40	32	32
	Month Average	13	30	22	38	34	41	31	-	31	36	35	31

Source: Malcolm Pirnie, Inc., 1975.

levels. The maximum 24-hour levels recorded were 236 and 222$\mu g/m^3$ at the Ohio State Fairgrounds and East 11th Avenue, respectively.

State standards for sulfur dioxide require that the annual arithmetic mean not exceed 60$\mu g/m^3$ and that levels during a 24-hour period not exceed 260$\mu g/m^3$ more than once per year. Ohio EPA data for sulfur dioxide are available for the period from April 1974 to February 1975. During this time the arithmetic mean was 31$\mu g/m^3$, well below maximum standards. Although this figure is not based on a complete annual record, it is an indication of levels over a long-range period. Average levels of sulfur dioxide during 1970 ranged from 10 to 50$\mu g/m^3$, with higher levels concentrated in the center of Columbus. Examination of OEPA daily data from the same period indicate that of 19 to 36 days sampled at three stations, no days had sulfur dioxide concentrations in excess of maximum standard values.

Standards for nitrogen dioxide require that the annual arithmetic mean not exceed 100$\mu g/m^3$. The data summary in Table 2-6 indicates that for a 10-month period the mean value was 50$\mu g/m^3$. This figure can be used as an indication of what average annual values may be.

H. Land Use and Future Growth and Development

1. Overview

Growth of population and industry has been occurring to a large extent, north of the center of Columbus. This trend has influenced growth in the project area in the past and can be expected to have an expanding influence in the future. Other major factors enhancing growth potential in the project area are its excellent arterial and feeder system of highways, its large tracts of relatively inexpensive, level land, its easy access to major centers of employment, and its excellent recreation amenities. Poor waste assimilative capacities of the soil in most of the project area, combined with the lack of sewering, and a past building ban, is the major impediment to future development. However, private package systems and on-lot systems are still capable, if public sewering is not implemented, of accommodating significant amounts of development within the county.

Most future development in the project area can be expected to be residential. However, rising costs of land in Franklin County and Columbus combined with the availability in the project area of large, level, and comparatively inexpensive tracts of land near railroads and highways will encourage significant future industrial development. Commercial development within the project area will be primarily neighborhood-oriented. The highest rates of residential and commercial development can be expected in Orange and Liberty Townships. Most development in Concord Township will be residential and most will occur in the Shawnee Hills-Dublin area. In Liberty Township considerable amounts of residential development will occur around Powell and some industrial development will occur along U.S. 23 and the Chesapeake and Ohio Railroad. Several portions of Orange Township will experience considerable residential development, while land adjacent to the Penn Central Railroad has a potential for industrial development. Some scattered areas of residential development may be expected in Berlin Township. Strict zoning regulations in Genoa Township, if continued, would limit development to moderate amounts of residential and industrial uses.

2. Regional Context

The Columbus region has an excellent potential for future growth and development. As Figure 2-4 indicates, high earnings growth is projected for services, manufacturing, and government in Franklin, Delaware, and Pickaway Counties. Several factors provide the Columbus region with an excellent potential for future growth and development. Columbus is excellently located with respect to consumer markets. It is within 600 miles of 60 percent of the nation's markets and is thus attractive to industries with national markets. Columbus also has a major airport, Port Columbus International Airport, and is serviced by three trunk railroads, one of which, Penn Central, is considerably improving its present facilities. Columbus is also located at the intersection of Interstate Highways 70 and 71, providing rapid automobile and truck access in all directions.

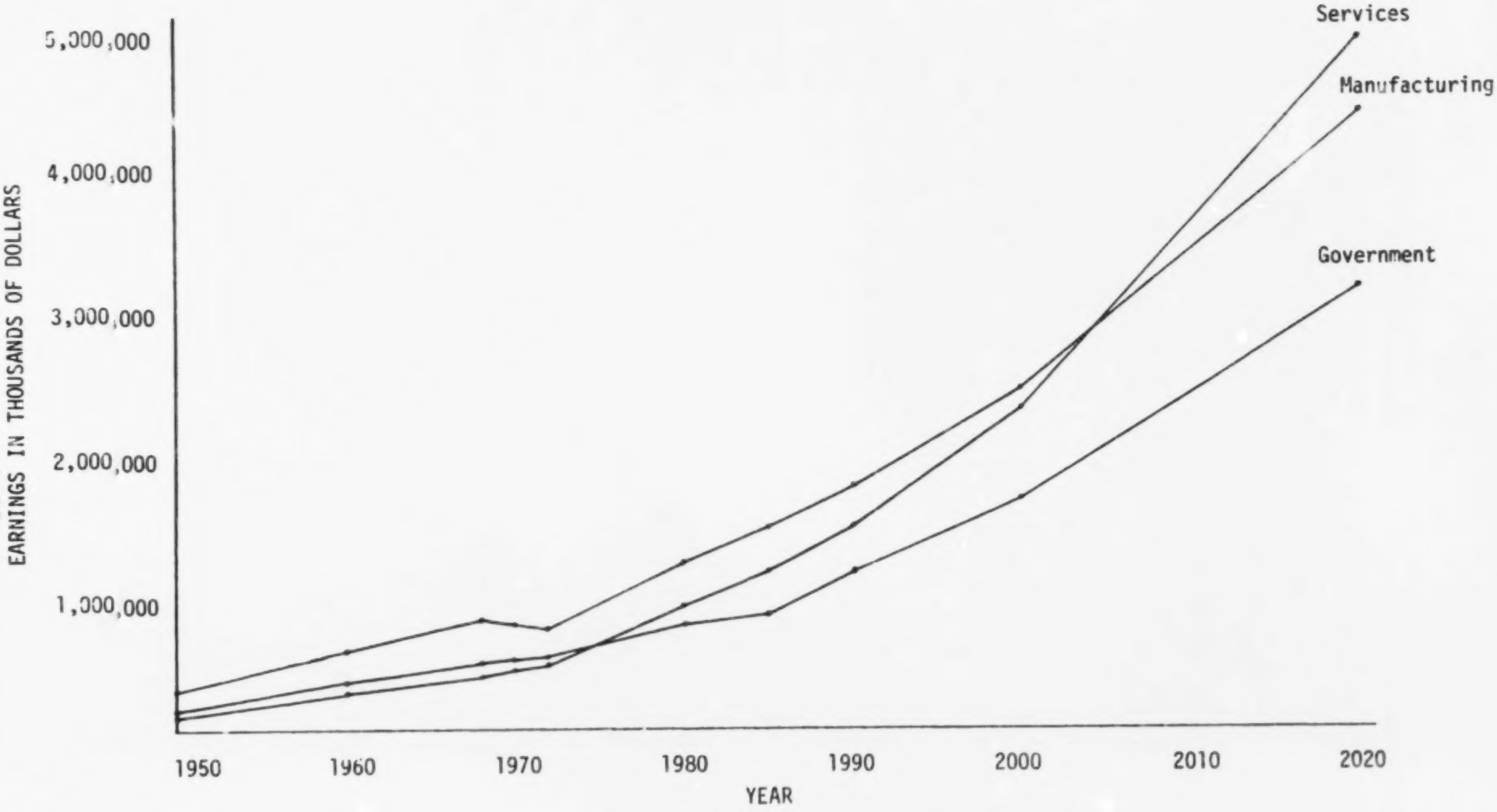


Figure 2-4. Increase of Earnings in the Region Composed of Franklin, Delaware, and Pickaway Counties in thousands of 1967 dollars

The Ohio State University and several other accredited colleges and universities are located in Columbus, attracting major education-related resources into the region. The state capital and numerous state and federal administrative organizations provide large amounts of stable employment, while the headquarters of numerous bank holding companies, insurance companies, and savings and loan associations provide substantial amounts of investment capital. Columbus also has a diversity of research and development activities. It is evident that Columbus has a diverse employment base with a well-educated labor force, thereby minimizing the severe fluctuations in employment that are common to more industrially-based regions.

There are numerous activity-oriented recreation facilities in Franklin County and nature-oriented recreation facilities within the other counties. Columbus's generally level topography and subsoils are suitable for construction of buildings so that costs for building factories, distribution facilities, and transportation arteries are minimized. Finally, deposits of coarse sands, gravel, and limestone support a significant quarrying industry.

Although Columbus has considerable potential for future growth and development, there are major factors which inhibit growth in the Columbus region. These include lack of deposits of minerals, coal, oil, clays, gas, or other deposits to support most basic processing industries and an insufficient water supply to support industrial development which requires substantial amounts of water, such as steel making, paper mills, and large chemical industries. In addition, Columbus is in competition with other lake-basin centers in the attraction of industry.

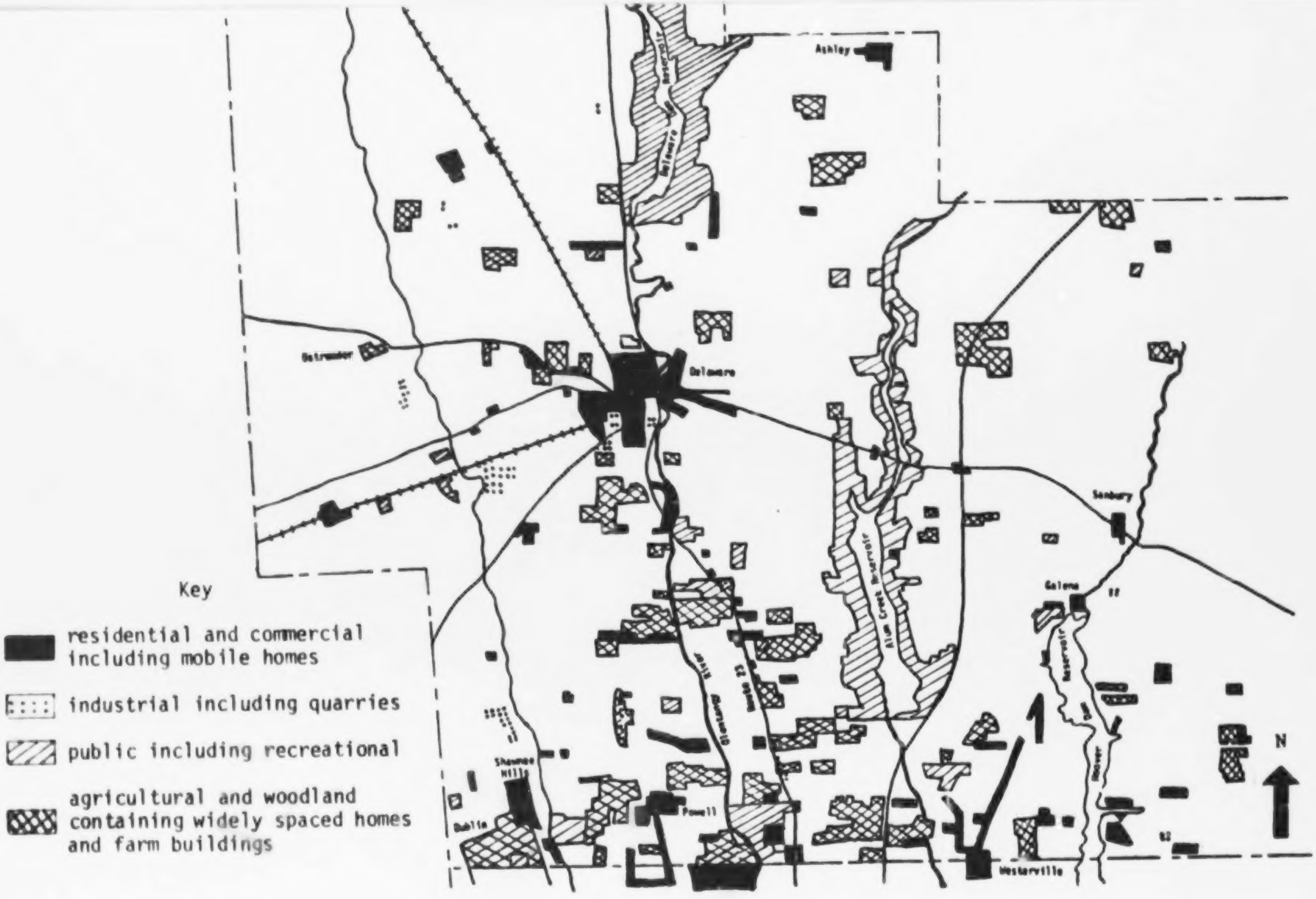
A number of special factors determine the location of growth and development within the Columbus region. The major growth-oriented purposes that the outlying areas of Delaware County serve are for low density housing, inexpensive land for industrial development, and recreational land. The major factors in determining to what extent each outlying county serves various growth-oriented purposes are: (1) accessibility to major areas of employment (2) accessibility to residential services; (3) provision of sewer, water, gas, and electricity; (4) quality and regional scarcity of recreational resources; (5) directions of growth within Columbus and Franklin Counties; and (6) the availability of sizable tracts of low cost land which does not require costly modification to make it suitable for development.

When Delaware County is analyzed in terms of the above factors, a picture of strong potential for growth emerges. The northern portions of Columbus have the most desirable centers of employment and excellent highway arterials making the southern portions of Delaware County very accessible to these desirable areas of employment. These highway arterials also give easy and rapid access from the southern portions of Delaware County to residential services in the City of Delaware, Westerville, and downtown Columbus. In addition, Delaware County has widespread provision of water, gas, and electricity services and large surpluses in facilities for most of those recreational activities for which there are insufficient facilities in the rest of the region. Finally, growth in Franklin County is occurring primarily to the north toward Delaware County and, to a lesser extent, to the east and southeast, as numerous large tracts of land suitable for residential subdivisions or industrial activities are presently being held for speculative purposes.

3. Service Area

Most of the land in the planning area is either used for agricultural, residential, or recreational activities or is held for speculation and future development. Industrial and commercial uses occupy a very small part of the total land area. (Additional information describing current land uses was given in Appendix D of the Draft EIS).

The most current available representation of land use planning in Delaware County (1973) is shown in Figure 2-5. The predominant residential feature of the planning area is the occurrence in roadside strips and small subdivisions of single-family detached homes interspersed with older, rural farm homes. Commercial uses generally consist of service stations, motels, restaurants and convenience stores widely scattered along transportation arterials or clustered near areas of residential concentration. Most manufacturing is concentrated in the area west and south of the City of Delaware. Elsewhere, industrial uses in the area are restricted to those of a few scattered light industries along U.S. Route 23 and the railroads.


Key
■ residential and commercial including mobile homes
⁙ industrial including quarries
▨ public including recreational
▩ agricultural and woodland containing widely spaced homes and farm buildings
Ashley
Delaware Reservoir
Ostrander
Delaware
Sunbury
Galena
Alum Creek Reservoir
Olentangy River
Route 23
Shawnee Hills
Dublin
Powell
Westerville
Hoover Dam Reservoir
N

Scale in ft.

0 10,000

Figure 2-5. Land Use for Delaware County

Source: Delaware County Regional Planning Commission, 1973

Land used for transporation is so located as to provide excellent accessibility to most portions of the project area by private vehicle. However, the capacity of most existing roads is not adequate to handle high volume traffic flows and will need modification to handle the increased residential population projected for the future. Agriculture is a major land use; however, large areas of agricultural land are held as speculative investments.

Land devoted to recreational uses is abundant and oversupplies local needs, but because of the regional orientation of most of the recreation facilities, they are used extensively by residents of other counties. The proximity and recreational demand of the nearby, rapidly expanding Columbus metropolitan area are significant factors which greatly influence Delaware County's recreation system. Delaware County has almost half of the total acreage of regional recreational facilities in the entire seven-county region surrounding Columbus. Delaware County also has nearly half the total acreage of outstanding natural areas and over one-third of the total acreage of natural environment areas, as defined by the Ohio Department of Natural Resources, including Highbanks Metropolitan Park.

The most current and detailed land use plan that describes the Delaware County is the concept plan developed by Surveys Unlimited (1973). It describes and/or delineates the planned location of the following land use elements for a 20-year planning period:

- Regional role of Delaware City
- Major commercial areas
- Major industrial areas
- Major residential areas
- Major public and semipublic areas
- Major vacant and open space areas
- Major improvements to the transportation system.

The geographical location of these plan elements is shown in Figure 2-6.

This concept plan recommends that Delaware City be the center of major commercial, administrative, health, and civic needs in the county. The increasing countywide orientation to Columbus makes the achievement of this concept less realistic. New major areas of residential development are expected in these portions of the project area:

- North and southeast of Powell
- North and south of Lewis Center
- East and west of Interstate 71
- North and south of Powell Road.

Major areas of residential expansion in the project area are expected north of Westerville and south and west of Shawnee Hills. Expansion of commercial areas is encouraged for Powell and Westerville in the plan.

The concept of planned commercial development is based upon the recommendation that growth of a countywide market be encouraged to locate in the City of Delaware and that convenience uses be encouraged in scattered areas thoughout the county. Major industrial development in the plan is recommended in the following portions of the project area:

- South of Home Road along the Chesapeake and Ohio Railroad

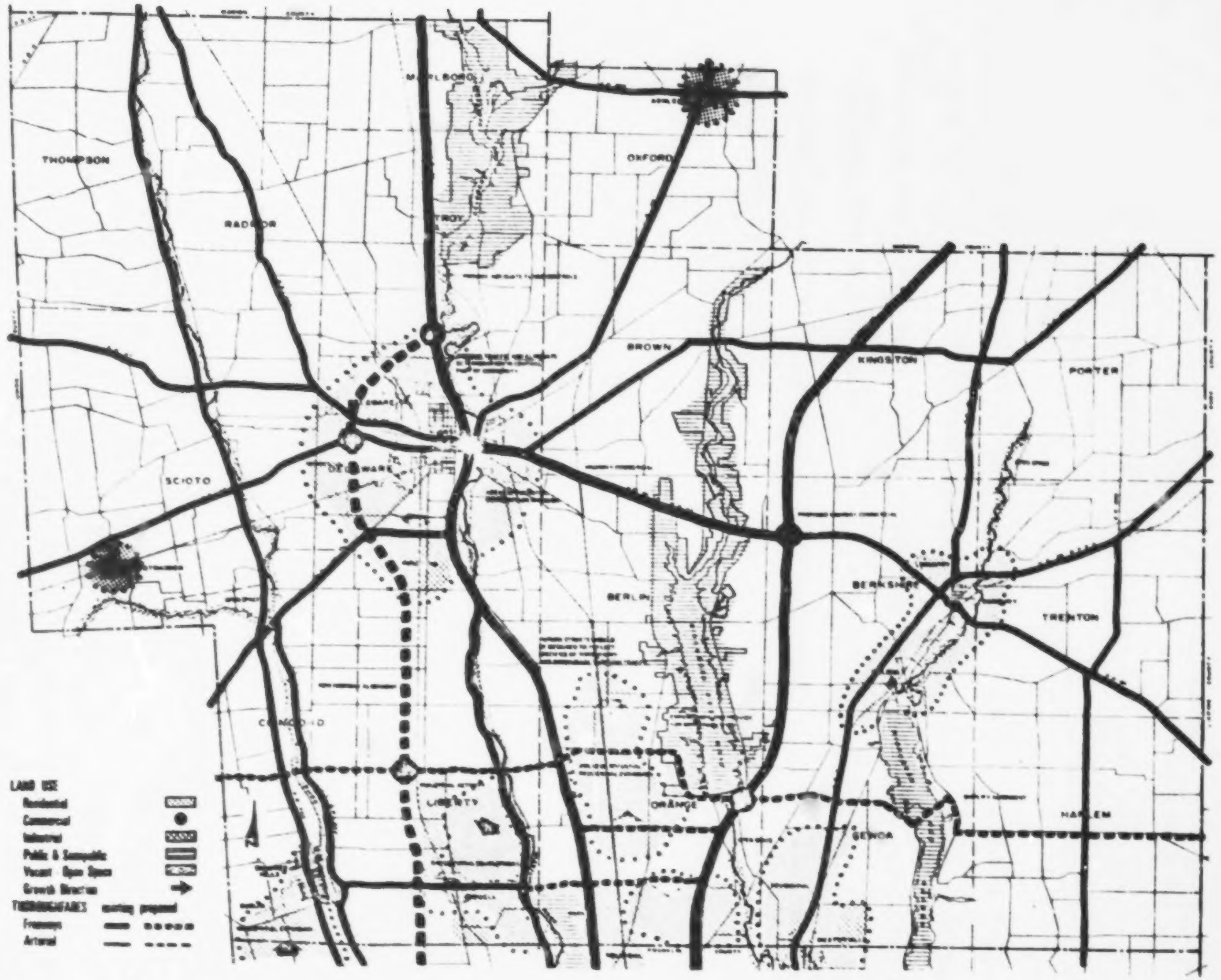


Figure 2-6. Land Use Plan for Delaware County

Source: Surveys Unlimited, 1973

- Along the Penn Central Railroad south of Powell Road and east of U.S. Route 23
- Northeast of Westerville along Maxtown Road
- Near the intersection of U.S. Route 36 and Interstate 71
- Near the intersection of Big Walnut Road and Interstate 71
- Along U.S. Route 23.

The plan's concept of recreational development centers around the development of additional facilities in the Highbanks Park and the Alum Creek Reservoir. Major areas of open space preservation are recommended in certain watersheds and along major drainageways. Recommendations for transportation include the improvement of the capacity of most existing arterial roads and collectors and the building of an interchange with Interstate 71 at County Road 109.

Information gained from various population, land use, and socio-economic trends helps define aspects of growth and development in the service area. Population trends show that population growth is occurring at an increasingly high rate. Land use trends show that there are large concentrations of both speculative land tracts in Liberty and Orange Townships and recent residential development in Concord, Genoa, and Liberty Townships. Since 1964 there have been more housing starts in the service area than in the much larger area comprising the rest of the county. Land use trends also reveal that significant decreases have occurred recently in farm populations, and that an increasing percentage of workers are commuting to Franklin County.

Current demand for residential development is indicated by the strong demand for year-round homes whose location satisfies both vacation needs and easy accessibility to year-round employment. Seasonal vacation homes are generally constructed in those areas located within several hours highway travel from major metropolitan areas and having considerable recreational amenities. The service area exhibits both of these characteristics; it is possible to live in the service area, commute to Columbus, and still have a house that is located in a high quality vacation environment.

Residential development is currently constrained by a strict septic tank ordinance. Although there is currently no actual building ban, a septic tank ordinance affects development by demanding the use of central sewering systems in all but the smallest subdivisions of less than five lots and increasing the total cost of homes serviced by septic fields. This requirement increases the total cost of new homes serviced by septic fields because of two factors. First, each septic field must be built on a lot covering a minimum of one net acre. Second, there are special requirements in each septic system for two tanks and drains to protect against limited drainage.

Strict zoning in Genoa Township and floodplain zoning provisions in Liberty and Concord Townships are the only current major zoning constraints to development in the service area. There is zoning throughout the service area which varies from township to township. However, in most areas it is flexible enough to provide for a wide range of types of development.

Most of the zoning regulations have provisions which would allow high density developments such as planned unit developments (PUD), townhouses, and apartment buildings. However, at present, Genoa Township alone provides for a minimum residential lot size of one acre. Liberty and Concord Townships have rudimentary floodplain zoning provisions which restrict development in floodplains.

Most future growth and development will be residential. However, moderate amounts of industrial development can be expected in some areas and small amounts of neighborhood commercial development can be expected near areas of major residential growth. Rising land costs in the service area will preclude any significant development of new recreation areas. Major expected areas of residential growth and development are:

- along U.S. Route 23
- along State Route 315
- around the interchange of U.S. Route 36 with Inter-State 71
- Shawnee Hills, Dublin, and the Village of Powell
- around the proposed interchange of Interstate 71 with Lewis Center and Big Walnut Roads
- northwest of the intersection of U.S. Route 23 and Powell Road

Chapter 7 of the Facilities Plan has indicated a number of specific residential development areas proposed for Delaware County:

- Olentangy Woods, a 400 acre area to be annexed to Powell.
- Green Meadows Village in Orange Township. This is a proposed planned unit development (PUD) with 2,024 units on 500 acres.
- Muirfield Village is predominantly within Franklin County, southwest of Shawnee Hills. It is planned for 500 units plus golf courses.

- In the Alum Creek basin, 1,000 acres are planned for development along Powell Road.
- At Powell Road and Interstate 71, 350 acres are scheduled for 2,100 development units.
- By Westerville Reservoir, 400 acres can be developed with 400 homes.
- On Powell Road between Interstate 71 and the railroad, 6,000 development units are forecasted.

Major expected areas of industrial growth and development are along or near the Chesapeake and Ohio Railroad, the Penn Central Railraod, and the proposed interchange of Interstate 71 with Lewis Center and Big Walnut Roads. Commercial growth and development is expected to be oriented primarily to neighborhood needs. As such, some small commercial enterprises can be expected to locate near areas of growth and development.

I. Historic and Archeological Sites

Several historic buildings and archeological sites within Delaware County are on the National Register of Historic Places. Other sites or buildings have state or local significance. Information for this compilation was provided by the Ohio Historical Society. Figure 2-7 illustrates the site locations. One site on the National Register within the planning area is the Highbanks Park Works, which is believed to be a fortification of the Adena Indians. This site is located within the Highbanks Metropolitan Park. The earthworks consist of four elongated mounds about 3 feet high with a 3-7 feet deep moat, extended about 1500 feet in a semi-circle. The site has been disturbed very little since the time of its prehistoric occupation, which makes it especially valuable. The site probably represents a major fortified settlement of the Cole Indians, possibly descendants of the Ohio Hopewell Indian population.

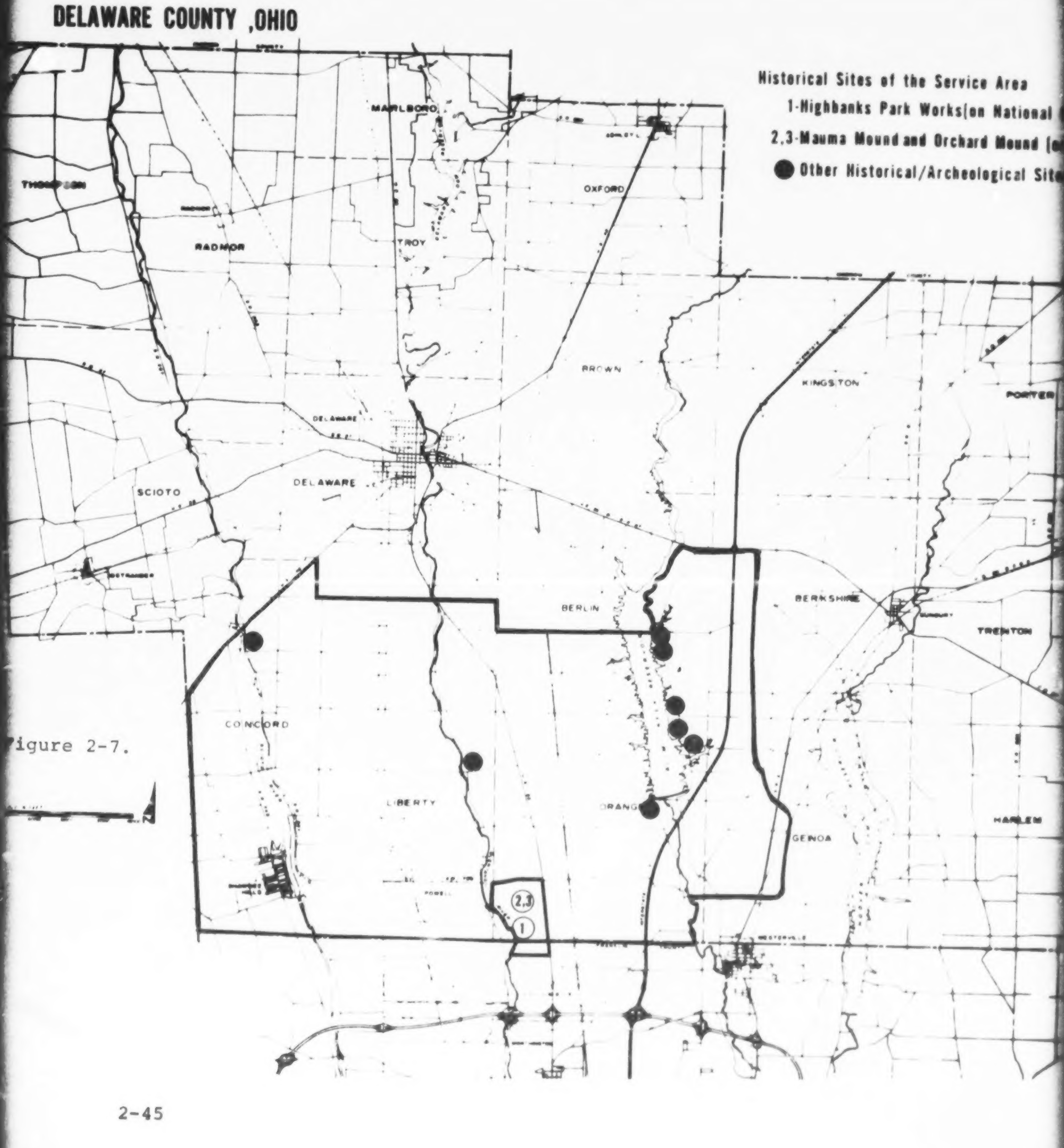

DELAWARE COUNTY ,OHIO
Historical Sites of the Service Area
1-Highbanks Park Works(on National
2,3-Mauma Mound and Orchard Mound (o
● Other Historical/Archeological Sit
MARLBORO
THOMPSON
OXFORD
RADNOR
TROY
BROWN
KINGSTON
PORTER
DELAWARE
SCIOTO
BERLIN
BERKSHIRE
TRENTON
CONCORD
LIBERTY
ORANGE
GENOA
HARLEM
POWELL
2,3
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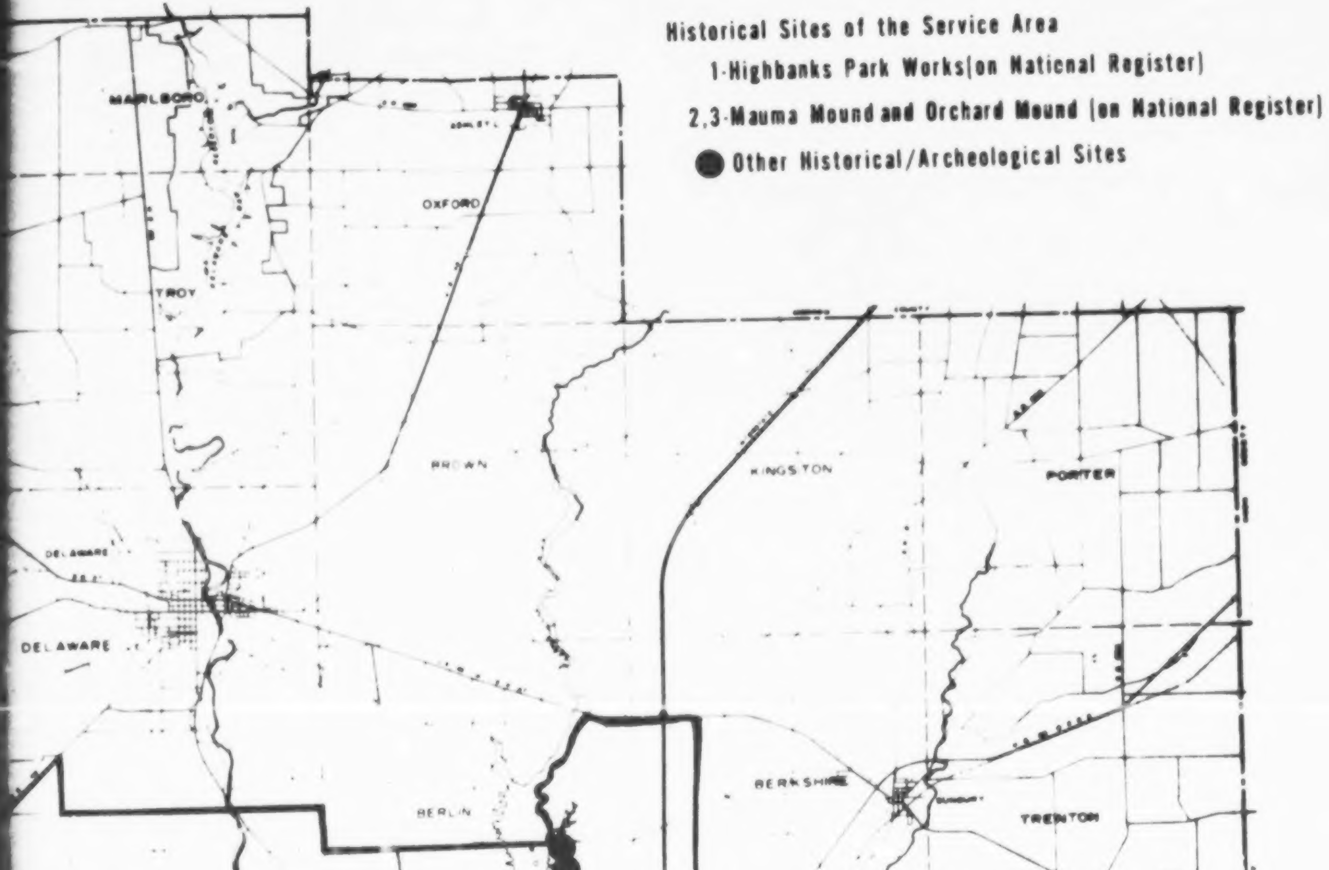
Figure 2-7.



Historical Sites of the Service Area

1-Highbanks Park Works(on National Register)

2,3-Mauma Mound and Orchard Mound (on National Register)

● Other Historical/Archeological Sites

It was first surveyed by Colonel Charles Whittlesey in 1836, with his account being published by the Smithsonian Institution in 1847. In 1951, the site was studied by Dr. Raymond S. Baby and the Ohio Historical Society.

Highbank Park Mound 1 (Muma Mound) and Highbank Park Mound 2 (Orchard Mound) of the Adena culture have recently been added to the National Register of Historic Places. They also are located within the Highbanks Metropolitan Park in Orange Township. The Muma Site has been partially excavated and is approximately 54 feet in diameter and 3 feet high. The Orchard Mound is a small mound 1.5 to 2 feet in height.

There are several other archeological sites located within the 20 year service area. These sites are shown on Figure 2-7 along with other significant historic sites.

A preliminary survey of the proposed treatment plant site by the Ohio Historical Society has yielded cultural materials, including flint chips, spearpoints, scrapers, knives, and fragments of stone tools. The site was perhaps occupied by Paleo-Indians (ca. 10,000 - 8,000 BC), Archaic (8,000 - 1,000 BC), Adena (1,000 BC - AD 200), Hopewell (200 BC - AD 500) and Cole (ca. AD 700 - 1,300) peoples. Slightly greater concentrations of material was found at the higher elevations, near S.R. 315, which is typical of the Olentangy Valley. Appendix J includes correspondence with the Ohio Historical Society on archaeological matters.

J. Environmentally Sensitive Areas

1. Archeology

Three significant archeological sites within the Highbanks Park have been described in Section I. A preliminary evaluation of the proposed treatment plant site has been undertaken by the Ohio Historical Society.

2. Geology/Topography/Steep Slopes

The shale Highbanks Bluffs on the Olentangy River are a significant regional feature.

3. Plants and Animals

The following animals have been found in or near the Olentangy River and are on the Ohio list of Endangered Wild Animals:

Mollusks: *Quadrula cylindrica cylindrica* - Cob Shell
Epioblasma torulosa rangiana - Northern Riffle Shell
Pleurobema clava
Simpsonaias ambigua
Fish: *Etheostoma maculatum* - Spotted Darter
Bird: *Haliaeetus leucocephalus* - Bald Eagle

Immature bald eagles have been observed as transient to Delaware County. Particularly significant biological areas include the natural areas of Highbanks Park.

4. Prime Agricultural Lands

About 86% of Delaware County is in Capability Classes I and II, which is considered ideal for farming, and is a valuable resource.

5. Recreation and Parks

Major regional parks include the newly developing Alum

Creek Lake facilities and the Highbanks Regional Park. Two youth camps are located at Flint Ravine on the Olentangy, south of Highbanks Park and another is located south of Delware City. Delaware County's stream corridors provide valuable water based regional recreation - fishing, boating and scenery. Along the Olentangy River, within Franklin County, an extensive park and trail system has been developed or is being planned. Priority I potential parkland is designated along the Olentangy to I-270. A mixture of park and residential areas is planned below that interchange. (Columbus Dept. of Recreation and Parks, 1974). Existing downstream parks include the Miller-Antrem Tract, the Olentangy Parkway, Whetstone Park, Clinton Park, and the campus of the Ohio State University (Malcolm Pirnie, 1975).

6. Flood Plains

Flood plains are a natural part of the river. Flooding is structurally controlled in the service area. Flood insurance has been discussed in Chapter 1.

7. Aesthetics

Presently southern Delaware County has extensive areas of open space and a predominantly rural character. A farmland vista is seen from the overlook at the Highbanks bluffs.

8. Scenic River

The Olentangy River has been designated as a state Scenic River in the southern part of Delaware County.

9. Scenic Highway

The Ohio Department of Transportation has designated

State Route 315 along the Olentangy River as a Scenic Highway (Cook, 1976).

K. Population and Economic Projections

1. Overview

Significant future economic and population growth can be expected in the planning area. Reasonably accurate projections of population in the planning area are 22,500 for 1980; 32,000 for 1985; 39,900 for 1990; and 61,300 for 2000. These can be compared to a highly accurate estimate of 13,196 on July 1, 1973. No projections were found which predicted future economic growth in either Delaware County or the planning area. However, the 1972 OBERS projections provide a reasonably accurate view of future economic and population growth in a region consisting of Franklin, Pickaway and Delaware Counties. Appendix D presents the reports studied and the evaluation methodology used.

2. Selected Projections

The evaluation in Appendix D yields several economic and population projections which project future trends in a reliable manner. The economic projections are Population Estimates and Projections and the 1972 OBERS Projections. The population projections are Population Estimates and Projections, Population Projections, and the 1972 OBERS Projections. Tables 2-7, 2-8 and Figure 2-8 describe the projected information. Table 2-9, as a comparison, lists the population projections made in the Facilities Plan.

Table 2-7. Anticipated Public Sewer Service Assumed in the Projections

Township	1975	1980	1985	1990
Berlin				Partial Sewering
Concord		Partial Sewering		
Delaware	City already sewered			
Genoa		Very little Sewering		Partial Sewering
Liberty		Partial Sewering		
Orange		Partial Sewering		

Sources: Adapted from U.S. Bureau of the Census, 1975
Delaware County Regional Planning Commission, 1973

The two economic and three population projections provide a baseline which can be used to estimate the socio-economic environment without the proposed action. The value of this baseline is influenced strongly by the length of the period of projection and the probable accuracy of each of the five projections on which it is based. Generally, the longer the period of projection, the more uncertain the results, therefore, the probable accuracy of each of the projections varies. The regional economic and population projections in the 1972 OBERS Projections are expected to be highly accurate. The 1973 population and economic estimates presented in Population Estimates and Projections are also expected to be accurate. The Columbus Area Chamber of Commerce maintains, though, that certain economic indicators point to greater regional population growth than is estimated by this method. Population projections can be

Table 2-8. Population Projections by Townships

Township	1970	1975	1980	1985	1990	1995	2000
Berlin	1,412	1,778	2,134	2,661	3,459	NA	7,784
Concord	2,732	3,412	4,094	5,119	7,501	9,754	12,631
Genoa	3,096	3,735	4,296	5,155	6,444	7,734	9,394
Liberty	2,625	3,353	6,073	7,773	9,716	12,145	14,575
Orange	1,902	2,174	5,924	11,324	12,824	14,748	16,951
Total	11,767	14,452	22,521	32,032	39,944	NA	61,341
Delaware	16,928	18,621	20,483	22,020	23,674	24,854	26,097
Total	28,695	33,073	43,004	54,052	63,618	NA	87,438
Delaware County	42,908	NA	75,695	NA	112,010	NA	148,434

Source: U.S. Bureau of the Census, 1970; Delaware County Regional Planning Commission, 1973

Table 2-9. Population Projections as Estimated in the Facilities Plan

Townships	1980	1990
Berlin	2,100	3,500
Concord	4,170	6,356
Genoa	4,722	7,144
Liberty	4,014	5,731
Orange	2,899	4,417

Source: Burgess and Niple, Ltd., 1974

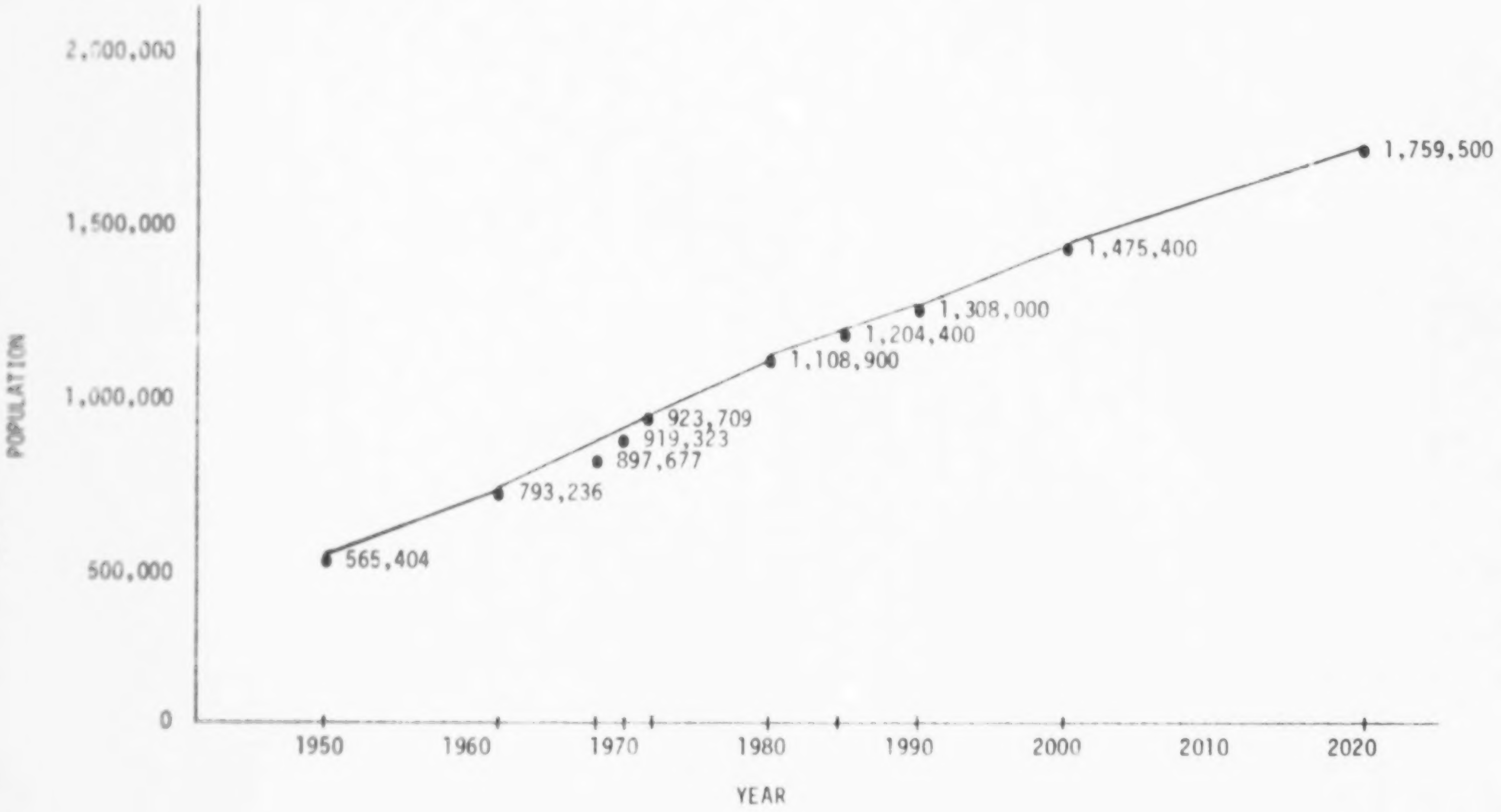


Figure 2-8. Population Projections for a Region Composed of Franklin, Delaware, and Pickaway Counties

Source: Adapted from U.S. Water Resources Council, 1974 expected to be fairly accurate because it is based on detailed, current, and ongoing knowledge of development in Delaware County. A factor which hinders its use as a projection of population without sewering is that it assumes sewering in most portions of the project area in the near future. However, considerable future development can be expected in the project area even if a public wastewater treatment system is not implemented.

The populations projected for each township differ from those projected in the facilities plan. Projections for most townships are higher than those projected in the Facilities Plan. A comparison of Table 2-8 with Table 2-9 shows that the projections of population in 1980 and 1990 for Liberty and Orange Townships are considerably higher than those of the Facilities Plan. The differences between the two sets of projections for Berlin, Concord, and Genoa Townships are much more moderate. The high rates of growth projected by this study for Liberty and Orange Townships are not only supported by the best population projection, but are also further substantiated by a detailed analysis of land use trends, as discussed in Section H of this chapter.

According to calculations based on the population projections in Table 2-7, the population that would be served by the proposed sewerage system would be 11,421 by 1985 and 28,591 by 1995. This estimate of the actual population served is subject to a number of variables: the overall population growth, the phasing of interceptor construction, the development of new housing served by the system, and the percentage of older housing which connects to the sewerage system and abandons septic tanks and package plants.

L. Aesthetics

Most of south central Delaware County is comprised of farmland or scattered single family homes. Several small communities are within the planning area and some commercial development exists along the major highways. The river corridors and their impoundments add to the visual interest of the county. The terrain grows steeper near the rivers, most intensively at the 100 foot Highbanks bluffs. Woodlands and parklands contribute to the natural beauty of the area. A 20 mile segment of the Olentangy has been designated as a State Scenic River. State Route 315 has been designated as a Scenic Highway along the Olentangy River.

CHAPTER 3
ALTERNATIVES

A. Flow Reduction Measures

The service area has no existing interceptor sewers, with the present on-lot sewage treatment systems. Therefore, an infiltration-inflow analysis is not required. Roof drains, foundation drains, and other clear water connections to the sanitary sewers are prohibited by a 1969 Delaware County resolution.

With the advent of the services of a water supply company in the service area a good quality water supply has become available to Delaware County residents. This tends to increase water use, above the older, more conservative usage patterns with well water. Wastewater production might be decreased by the reduction of water use by the residents of the service area. This could occur through increasing the cost of water the use of water-saving appliances, or consumer education on the importance of the water resource and its conservation. Water conservation could also be increased by utilizing water recycling or composting toilets. Existing plumbing would have to be converted to use either type of system. In 1975, one brand of composting toilet, according to its manufacturer, cost $615 to $735 per unit, plus venting and installation. In additon to the toilets, a grey-water system would have to be provided to accommmodate sink and bathtub wastewater. If septic tanks were abandoned, they would have to be filled in as a safety measure.

Individual systems such as these are not eligible for Federal sewage treatment grants. Funding home systems would have to be an individual or local matter.

Facilities Plan Configuration

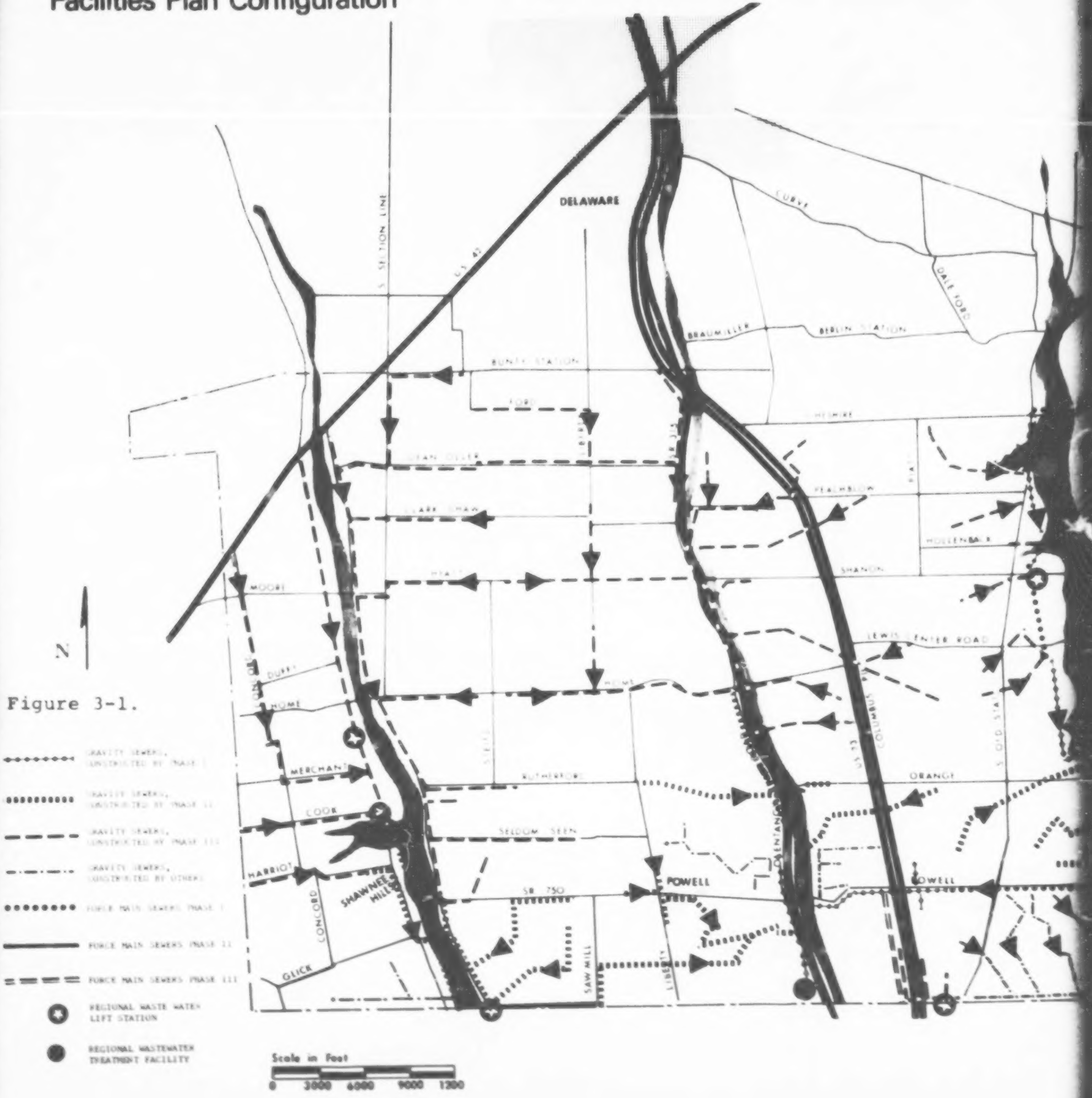
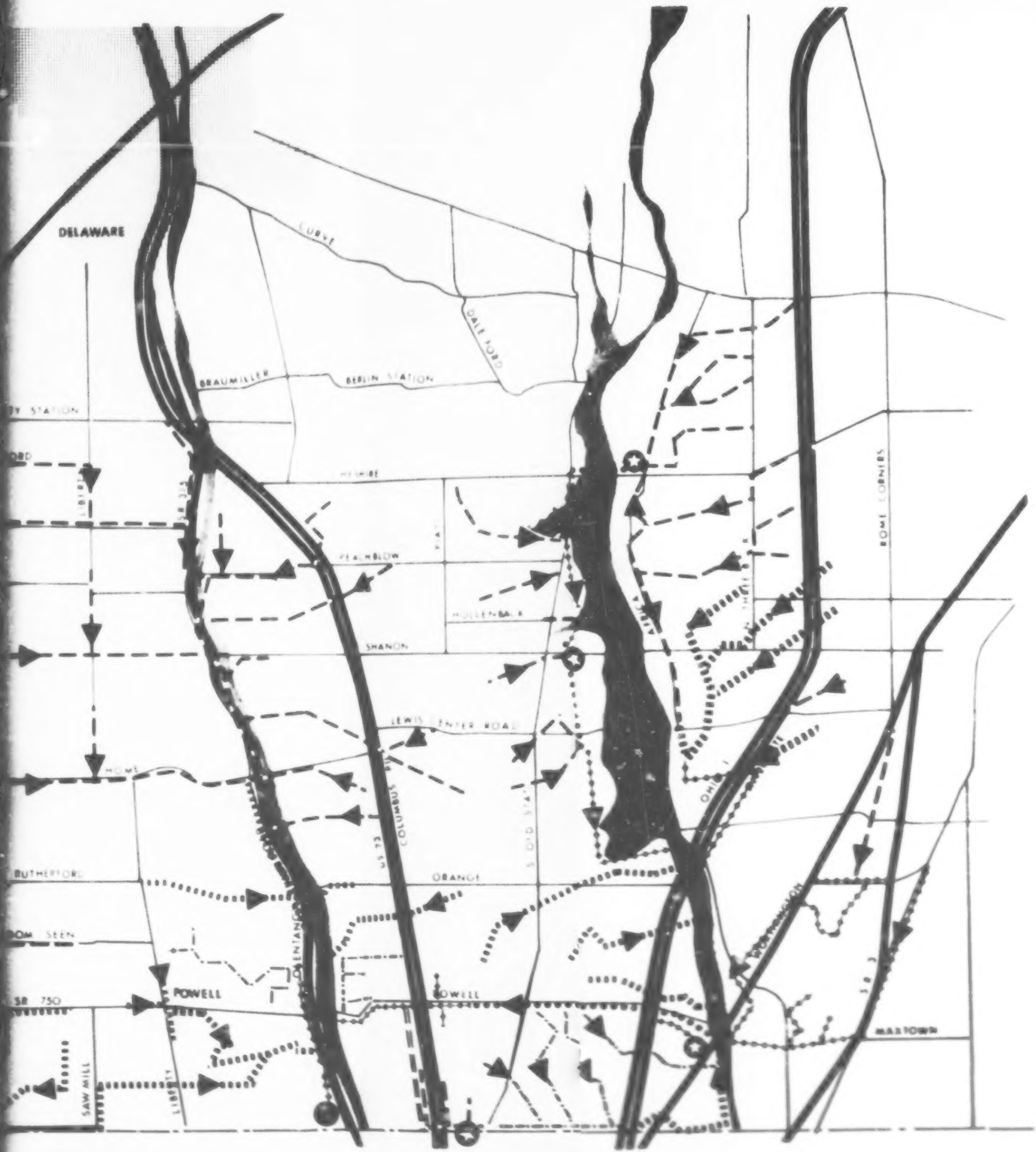


Figure 3-1.


DELAWARE
CURVE
DALE FORD
BRAUMILLER
BERLIN STATION
Y STATION
ORD
HESHIRE
LIBERTY
SR 315
PEACHBLOW
HOLLENBACK
SHANON
LEWIS CENTER ROAD
HOME
US 23
COLUMBUS
OLD STATE
AFRICA
THREE B
ROME CORNERS
OHIO
RUTHERFORD
ORANGE
DOM SEEN
OLENTANGY
SR 750
POWELL
POWELL
SAW MILL
LIBERTY
WORTHINGTON
SR 3
MAXTOWN

B. Interceptor Alternatives

1. Interceptor Phasing

The proposed interceptor lines from the Facilities Plan and Phase I plans and specifications are shown in Figure 3-1. Planning phases are expressed in terms of 10-year intervals, using 1975 as a baseline for Phase I. The first phase consists of a short line along the Olentangy River to Powell Road and a proposed residential development and existing homes leading to a major system in the Alum Creek Basin. This would serve outlying areas north of Westerville in the vicinity of Westerville Reservoir, and the area around Alum Creek Lake.

During Phase II, it is proposed to construct extensions along the Olentangy River to include the Village of Powell and more northerly areas, an expansion of the Alum Creek network, and the completion of a force main to serve the lower Scioto Basin, including Shawnee Hills. During Phase III, it is proposed to construct an extension of the sewer system northward in all basins. (Burgess and Niple, Ltd. 1974). While the Facilities Plan and this Environmental Impact Statement considers all three interceptor phases, the immediate USEPA grant for 75 percent of the interceptor construction costs will only apply to Phase I of this project. Completion of the collection sewers is a local financial responsibility. All of the interceptors proposed in the Facilities Plan are still subject to USEPA grant eligibility and cost allowability determinations.

A map supplied by the Delaware County Health Commissioner (May, 1975) shows that significant septic tank problem areas exist in Shawnee Hills, Powell, Seldom Seen Road, Carriage

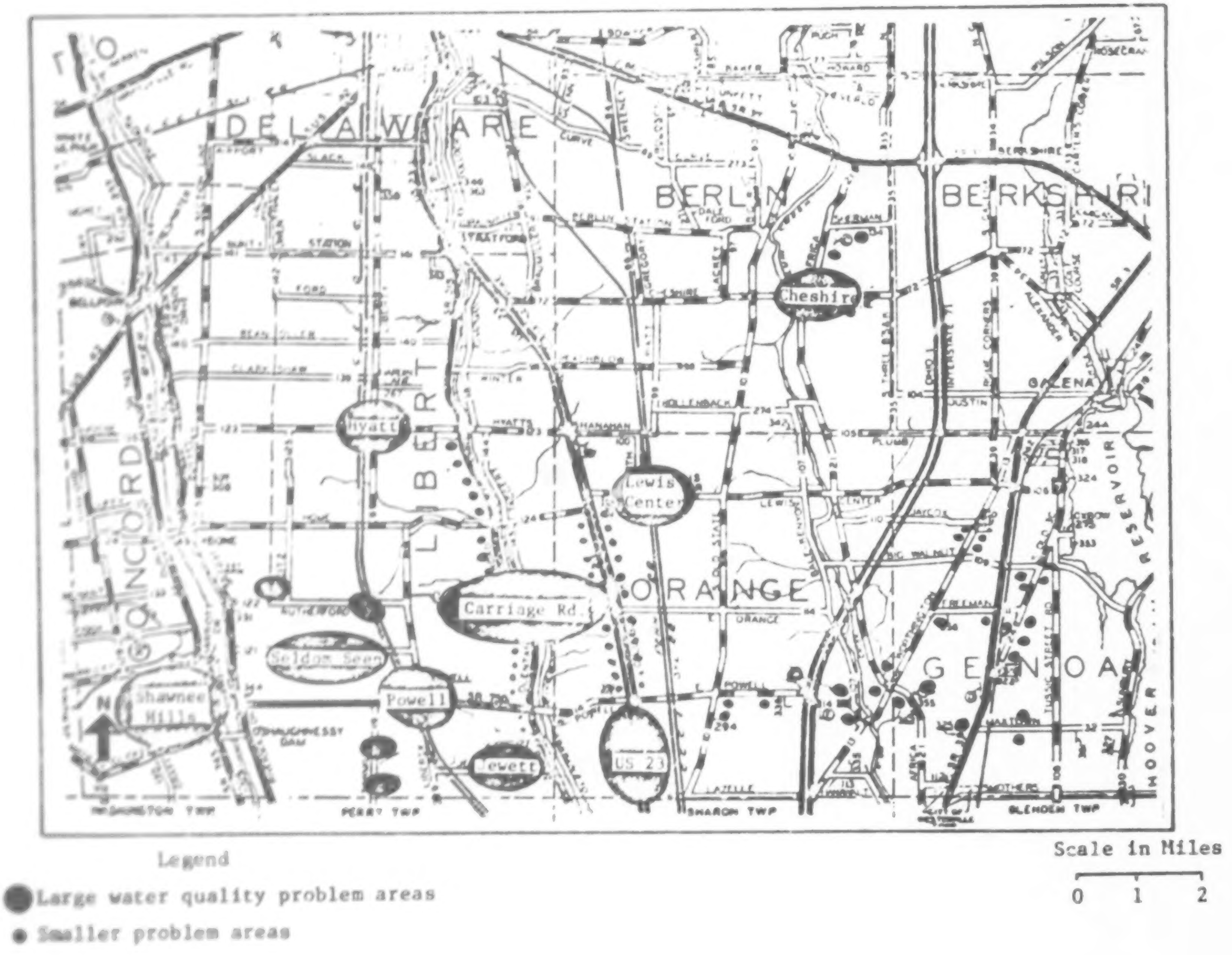


Figure 3-2. Existing Water Quality Problem Areas in Southern Delaware County

Source: May, 1975

Drive, Hyatt, Lewis Center, Cheshire, and the southern end of U.S. 23 (see Figure 3-2). Smaller problem areas occur in various areas in Liberty, Orange, Genoa, and Berlin Townships. Scattered rural development has led to scattered problem areas in the southern part of the county. Water quality problems result from untreated or poorly treated runoff from cesspools, septic tanks, and package plants and are caused by both the unsuitability of soils in the area for use as septic tank fields and operational problems of small sewage treatment systems.

The Delaware County Engineer's Office has estimated that 400 homes and the equivalent of another 430 homes (commercial and recreational) will be served by the initial phase of the project. These are predominantly in the Alum Creek basin. Phase I would serve approximately 16 percent of the total existing homes in the three phases of the service area. Substantial additional flow is contributed by non-residential users. Phase II adds significantly to the number of users by including Powell, Shawnee Hills, and additional subdivisions and rural areas. It is not until the proposed Phase III, however, that over half of the present homes would be served.

Rapid population growth is aniticipated in the service area, which will increase the number of persons served by the system. Connecting to the system will be mandatory for homes constructed after the formation of the sewer district in 1969. In addition, Amended Substitute Senate Bill 111 has recently become Ohio law. This permits the County Commissioners to resolve that a house that is within 200 feet of an existing sewer right-of-way must tap into the sewer system. Delaware County is planning to encourage voluntary tap-ins by a variable fee schedule, which will increase after the first year that houses are able to connect to the sewer system, thus making early tap-in less expensive.

The Phase I configuration is designed to protect the Westerville and Alum Creek Reservoirs. Existing population centers are fragmented making it difficult to initially serve most of the area's residents. If the sewerage system connects to a local plant in Delaware County, the basic phasing plan of Figure 3-1 would be retained. The system would be slightly modified for the regional subalternative. The details of this will be discussed later in this chapter.

Each phase of interceptor construction could be modified in order to provide service to different areas, if desired. A step II grant application for preparing the detailed plans and specifications for the Powell area is on the Ohio Priority List. However, it has been assigned a number that is outside of the projected funding range for this year. Temporary waste treatment facilities - package treatment plants or sewage treatment lagoons - could be designed for the recreation areas on Alum Creek Lake, if Phase I of the interceptors were to serve a different part of Southern Delaware County.

2. Stream Crossings

Placement of sewer interceptor lines across or beneath stream beds can cause temporary or permanent disruption of stream flow and bed materials, and a corresponding increase in sedimentation. This may in turn lead to adverse impacts on water quality and sensitive biological organisms. These impacts can be minimized by careful consideration of:

- Number of crossings
- Placement of crossings
- Construction phasing
- Construction techniques

Minimizing the number of crossings and correct placement of those that are necessary are both important early in the planning process because these crossings affect emplacement of lines that lead away from the stream. Construction phasing provides assurance that such adverse impacts as erosion or sedimentation, which might occur during temporarily delayed construction, would be minimized. Construction techniques are related to crossing emplacement in that bedrock depth and soil type are determining factors in the identity of the environmental problems posed and both the cost and technical feasibility of the construction methods used.

The common method for minimizing stream crossings in a basin is to align interceptors along both sides of the river. This permits connections to any portion from outlying areas with the use of gravity flow interceptors. This scheme is used on both the Scioto and Alum Creek Watersheds in the Delaware County Facilities Plan interceptor plans because of the difficulty of constructing a crossing of the reservoirs. The present design for the Olentangy River includes ten stream crossings between Winter Road on the north and the Delaware-Franklin County line (Figure 3-3). Some of these crossings are designed to avoid areas in which rock excavation or deep entrenchment would be required; others are so located to avoid forested

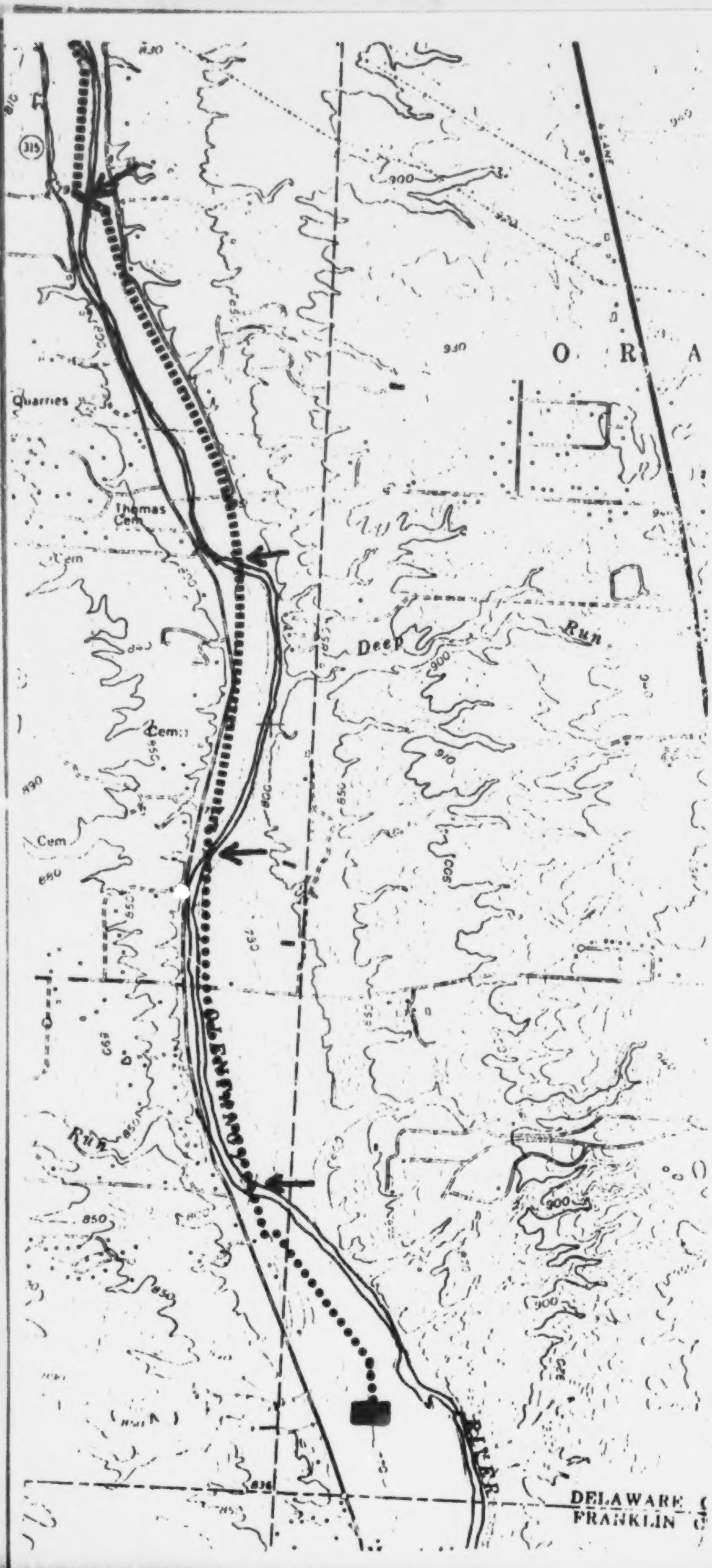


Figure 3-3-a.

Interceptor Crossings of the Olentangy River

•••••••••••• Phase I

▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪ Phase II

arrows indicate crossing locations

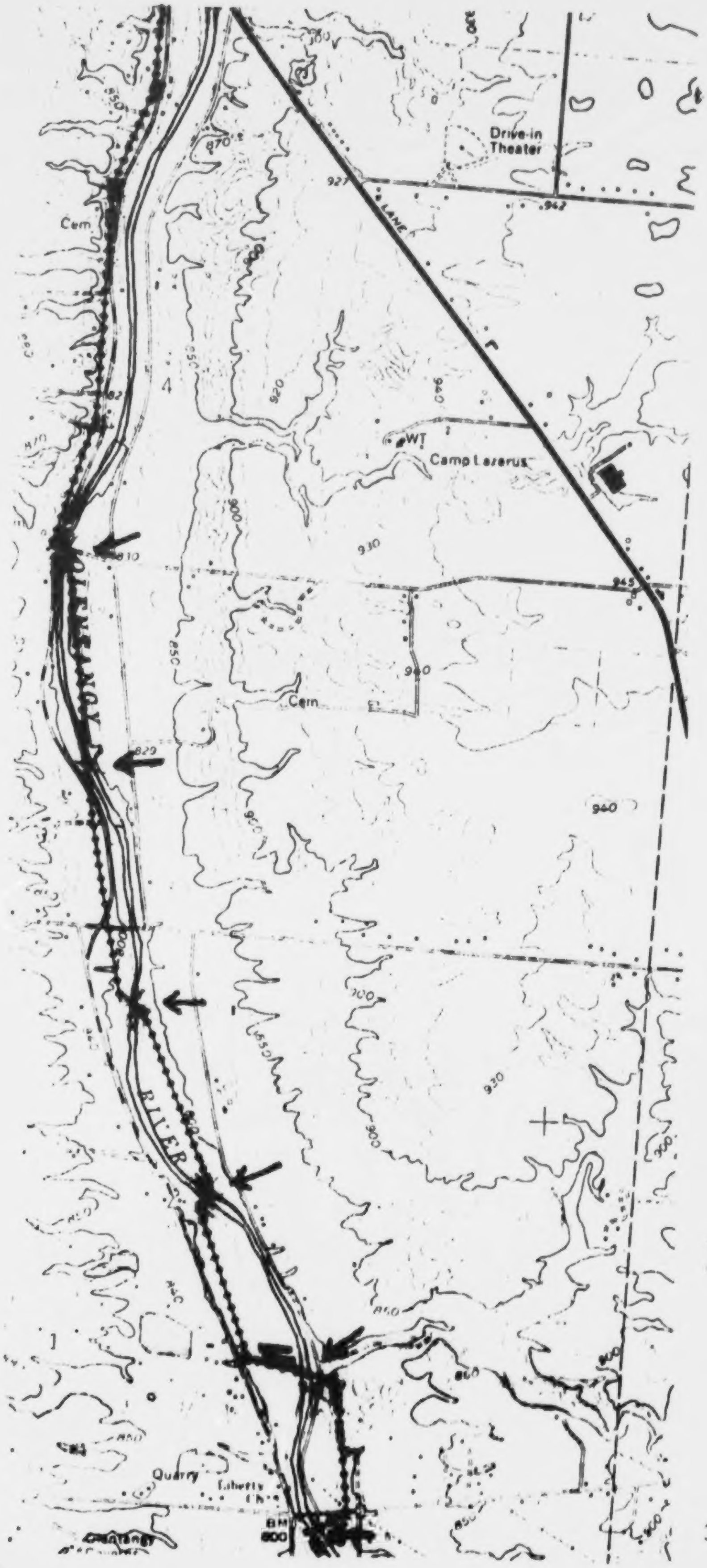


Figure 3-3-a.

Interceptor Crossings of the Olentangy River, continued

Phase III

arrows indicate crossing locations

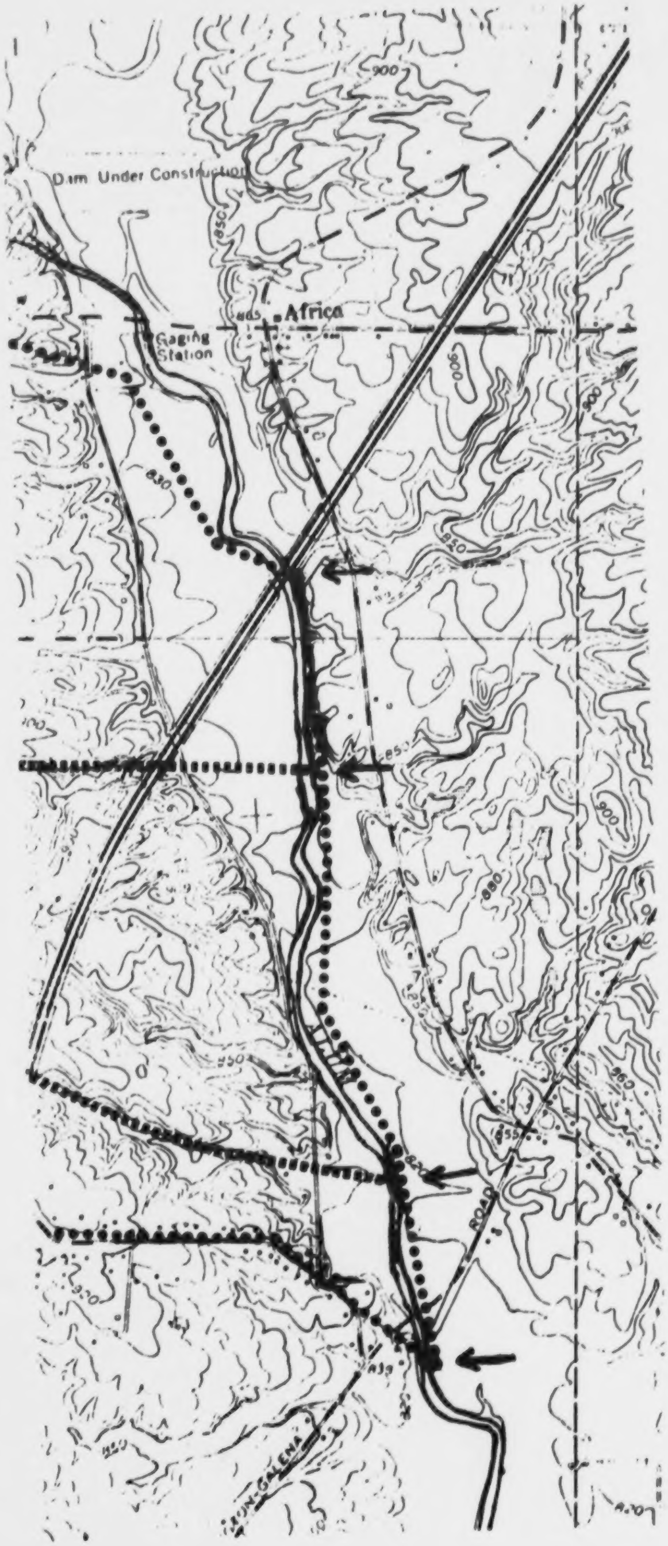


Figure 3-3-b.

Interceptor Crossings of Alum Creek

•••••••••••• Phase I

•••••••••••••••••• Phase II

arrows indicate crossing locations

areas; others are used to enhance gravity flow. The large number of crossings also facilitates connection with future housing developments and prevents developers from constructing their own lines across the Olentangy in order to connect with sewer service. In certain reaches of the river, these objectives may also be accomplished at some additional expense with a double line system. Section 10 Permits will ber required for stream crossings of the Olentangy River by the U.S. Army Corps of Engineers.

Three stream crossings of Alum Creek below the dam are indicated in the Facilities Plan for Phase I of the project, as shown in Figure 3-3. These have been planned for environmental and engineering reasons. A double line system would be an alternative for two of these crossings. One crossing of the Scioto River was proposed in the Facilities Plan, just above the county line.

Several construction techniques may be used for stream crossings. Total or partial diversion of the river could be utilized during construction. The crossing may be directly dredged, or it can be bored under the streambed with no surface disruption. Section 404 Permits may be required by the U.S. Army Corps of Engineers for fill projects. All crossings of the Olentangy will require the approval of the Ohio Department of Natural Resources, because it is a State Scenic River.

C. Site Location

1. Introduction

a. Description of Alternatives

There exist a number of possible local and regional alternatives to the proposed action. The ones discussed here are all alternatives which have been suggested by local and regional officials, engineers involved in the wastewater management of the project, and other interested parties.

The local alternatives are discussed first. Although the term local is used to designate the Delaware County alternatives in this report the system proposed in the Facilities Plan has been considerably expanded from the Feasibility Survey. (Burgess and Niple, 1970). Originally the project was only serving the Olentangy basin, but it has been expanded to include the Scioto and Alum Creek basins. The local alternatives are comprised of 13 possible plant sites located on the three basins of the planning area (see Table 3-1 and Figure 3-4). The first two letters in each site code denote the river basin, for example SR denotes Scioto River,and the number that follows is assigned on a general south to north basis in each basin.

The local alternatives are discussed in Sections 2 through 7. These alternatives are grouped into geographic areas such that many site characteristics within each group are similar. This facilitates selection of the best alternatives, since one site can be selected from each group based on the relative merits within the group. These sites are then compared in Chapter 4.

The regional alternatives involve construction or use of other facilities than the one proposed by Delaware County. These are illustrated in Figure 3-5. Merger of the service area with

Table 3-1. Proposed Alternative Sites and Major Existing Plants in Delaware and Franklin Counties

Site Code	Basin	Site Description	Elevation, in ft above msl	Eventual Avg. Capac. in mgd	Source
OR1	Olentangy	S. of I-270 in Franklin Co. along channelized section	850	6.00	Dr. Stein, 1974
OR2	Olentangy	W. of Ohio 315, N. of I-270 in Franklin Co.	860	6.00	Enviro Control, 1975
OR3	Olentangy	W. bank, 1 mile S. of Powell Rd.	775	6.00	Burgess and Niple, 1970
OR4	Olentangy	E. bank, 0.25 mile S. of Powell Rd.	775	6.00	Burgess and Niple, 1970
OR5	Olentangy	E. bank, 0.1 mile N. of Powell Rd.	775	6.00	Burgess and Niple, 1970
OR6	Olentangy	S. of Powell adjacent to C&O tracks and county line	910	6.00	Burgess and Niple, 1970
OR7	Olentangy	W. of river near Powell	890	6.00	Mr. Hutchins, 1975
OR8	Olentangy	E. bank, Jct. of Chapman and Winter Rds.	835	6.00	Burgess and Niple, 1970
OR9	Olentangy	E. bank, Jct. of Bean-Oiler and Chapman Rds.	835	6.00	Burgess and Niple, 1970
OR10	Olentangy	W. bank, 4000 ft. S. of Stratford	825	6.00	Burgess and Niple, 1970
OR11	Olentangy	S. end of Cherry St., Delaware	860	2.50	Existing Plant
AC1	Alum Creek	near Powell Rd. and Alum Creek	825	6.00	Burgess and Niple
AC2	Alum Creek	0.5 mile S. of Jct. Ohio 84, Ohio 10 near Killborne	920	1.25	Finkbeiner & Co., 1969
SR1	Scioto	at southern Franklin Co. line	680	60.0-120.0	Existing Plant
SR2	Scioto	at I-270 and Frank Road-Franklin Co.	700	100.0	Existing Plant
SR3	Scioto	0.5 mile S. of Ohio 198 bridge over Scioto near Radnor	910	0.50	Finkbeiner & Co., 1969

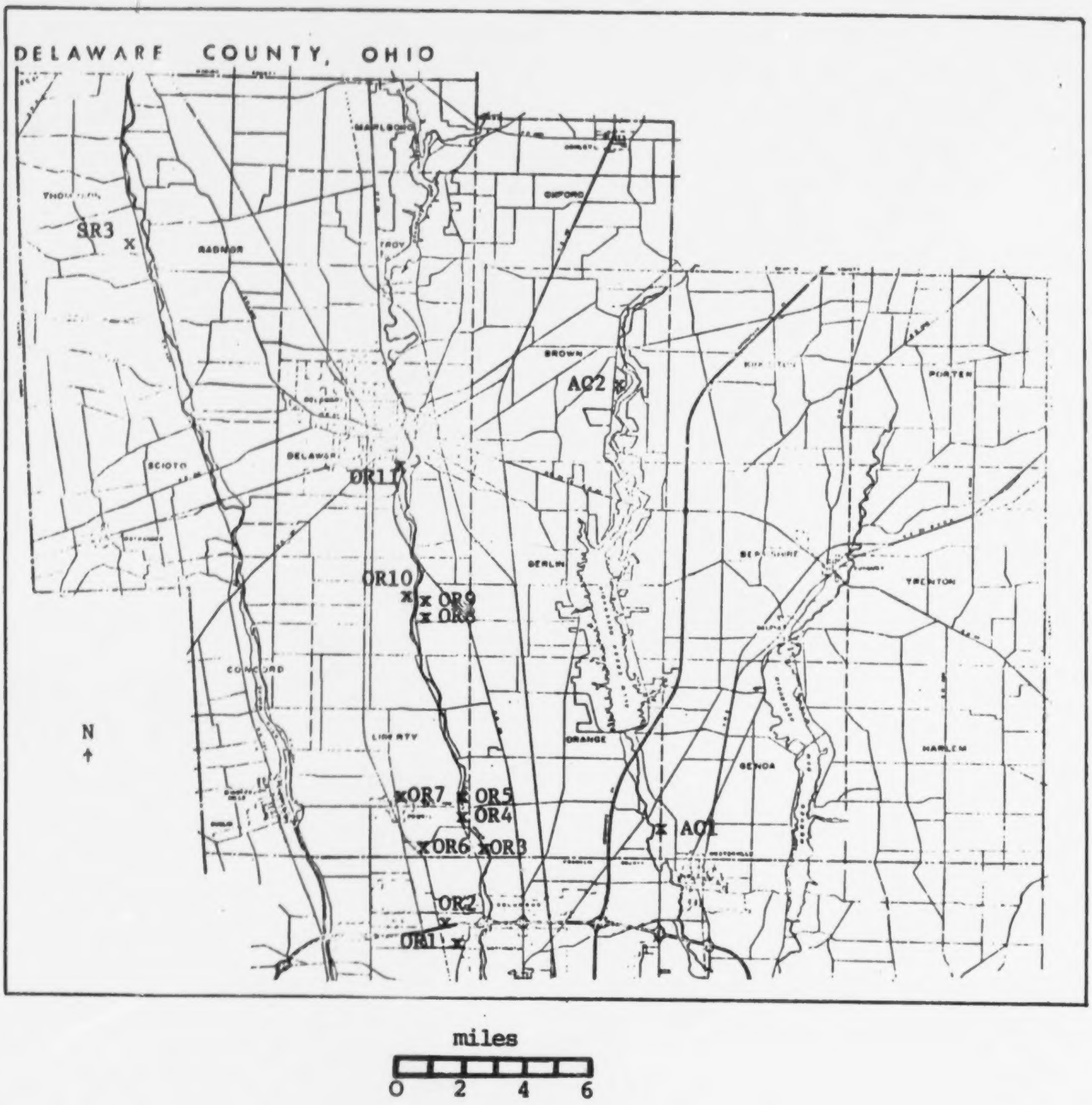


Figure 3-4. Local Alternative Treatment Plant Sites

Source: Enviro Control, Inc., 1975

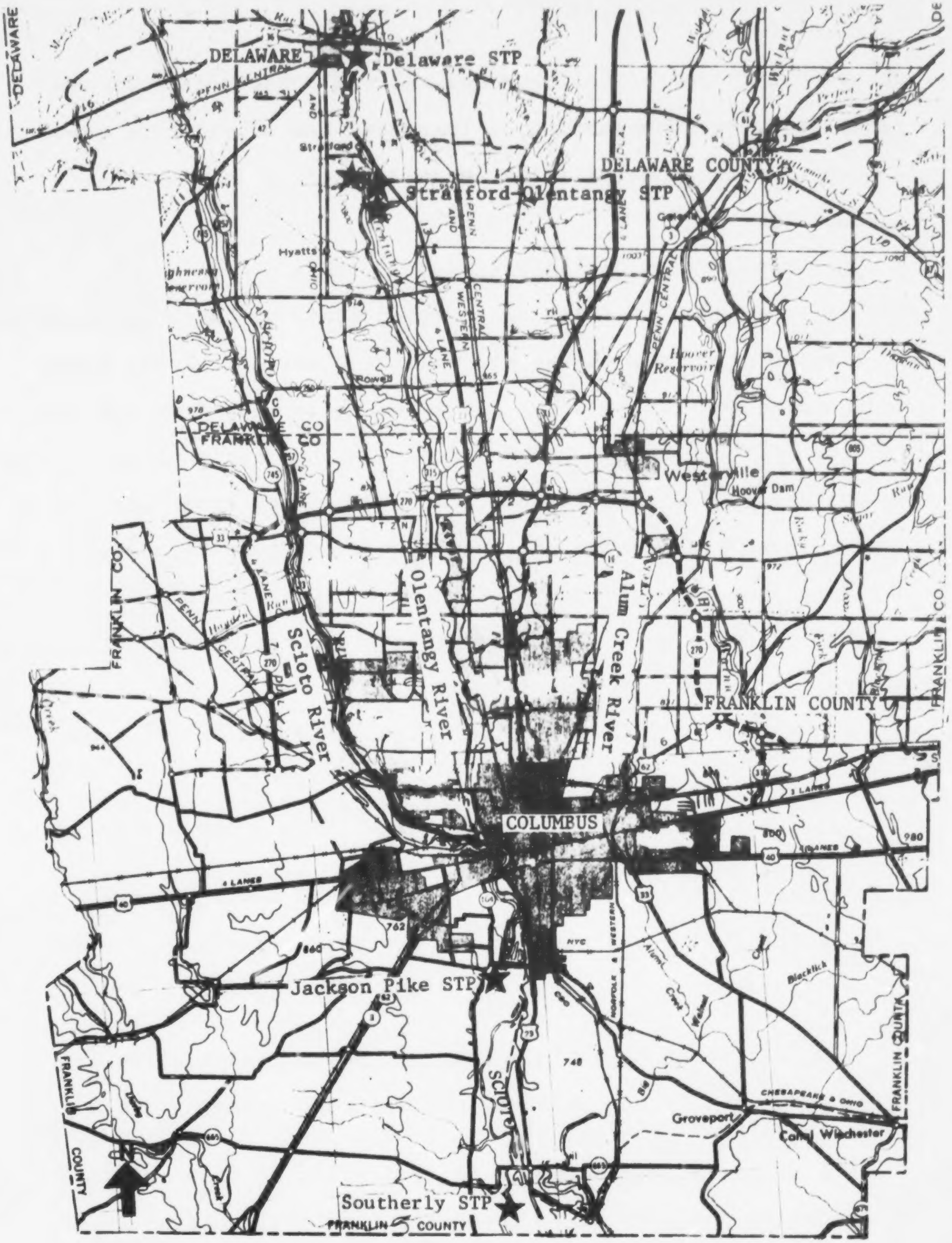


Figure 3-5. Regional Alternative Treatment Plant Sites

Delaware City and/or Columbus may require construction of new facilities, or augmentation or increased use of existing ones. A number of sub-possibilities are discussed in Sections 8 through 10.

b. Engineering Considerations

It is assumed that the engineering study of local alternatives is limited primarily to the STP sites and the additional sewer and pumping requirements for conveying the sewage from the collection point to the proposed sites. The collection point of the sewer network would be located at the Olentangy River and Powell Road. Therefore, change of sewer system configuration would not influence the engineering work of a given site.

The criteria or evaluative parameters considered for the local alternatives are listed as follows:

- Pumping facilities requirements in the context of topographical characteristics of the site.
- Structural requirements for flood damage control as related to the site location, if it is in the floodways.
- Sewer requirements as a function of site location with respect to the collection point of the sewer network.
- Outfall pipe and work in the context of outfall location.
- Excavation work related to subsurface conditions and slope of the site.
- Modification of buildings according to land availability.
- Additional river, highway, or railroad crossings as a function of site location.

The criteria considered in the valuation of the regional alternatives are similar to those for the local alternatives, but on a larger scale. However, the regional alternatives emphasizes system configuration, available facilities and interceptor network, and the system requirements. Therefore, some information, such as requirements for flood abatement, excavation work and building modification, would lose its significance in the evaluation of the regional alternatives. Uniform soil conditions have been assumed to be applicable for the whole region so that the cost of trenching and excavation for a linear foot of sewer of a given diameter would be the same throughout the whole area. Local conditions can, however, increase construction costs, and these are noted where applicable.

For each regional alternative, the available facilities and interceptors are estimated for their available hydraulic capacity and level of sewage treatment, the expansion of existing treatment facilities and interceptor sewers, or construction of a new wastewater treatment plant, its collection system and pumping facilities. Appendix E presents a detailed discussion of the engineering considerations.

c. Land Use Considerations

Land use is considered in this report in the analysis of all alternatives except for the regional alternatives. Those areas of concern which are covered in the land use analysis in Appendix E for each alternative are:

- Current land use at site
- Current land use in vicinity
- Primary impacts of plant
- Secondary impacts of plant
- Primary impacts of sewers and outfall pipe
- Secondary impacts of sewers and outfall pipe.

Since the eventual service area of each of the alternatives is identical, differential land use impacts between the alternatives studies are limited to local effects due to the plant or the outfall. Thus, the geographic scope of the land use analysis of each alternative is limited to an area within one mile of the plant, one mile of the outfall and outfall line, and downstream from the outfall.

There are, however, three major land use problem areas associated with the analysis of alternatives. These are:

- Secondary effects associated with any downstream changes in water quality
- Compatibility with present land uses on and near the site
- Compatibility with potential or probable future land uses on or near the site.

The secondary effects associated with any changes in water quality downstream from treatment plant outfalls are primarily related to impacts on recreation uses located near Alum Creek and the Olentangy River. Many of these uses depend, either directly or indirectly, on water quality.

d. Environmental Considerations

Four major areas of environmental problems for all the alternatives are considered. They are water quality impacts, visual impacts, noise, and odor problems. Appendix E discusses these considerations for each alternative.

To define and even quantify water quality impacts resulting from an alternative action, the existing water quality conditions are examined and compared with the stream water quality standards establshed by the Ohio EPA. Violations of these standards are reported and responsible source types are identified. Conformity of all alternative actions with the Scioto Waste Load Allocation is examined and discussed. The stream quality projected by the computer simulation, which utilized the spatial distribution of pollution sources as inventoried in the Waste Load Allocation Report of the Scioto River Basin, is compared with the stream water quality standards to assess any water quality degradation in the future at the low flow values used for this modeling. After all the above analyses are undertaken, the compatibility of the alternative action with the environment in terms of water quality is then assessed.

Visual impacts of the treatment plant are determined by the architectural design of the plant itself, by the effectiveness of screening and by the distance to receptors. It can be seen from Table 3-2 that the plant and its surroundings would be within 1/2 mile and presumably clearly visible from residences at all local alternative sites. In certain areas existing trees provide screening to hide the plant and blend it into the surrounding area. In order to make the plant aesthetically pleasing, architectural modifications and landscaping have been planned for the proposed facility. These modifications would ensure that the visual impacts of the plant would be considerably less detrimental to nearby residential or recreational land uses.

Compatibility of the project noises with its environment depend heavily on the noise levels that have been experienced in the project area. For example, locating a sewage treatment plant close to a heavily traveled highway interchange would probably be very compatible, because the noises from the plant might be well masked by the traffic noises.

Table 3-2. Distance From Site Center to Nearest Existing Structure or Parkland as of 1973

Site Code	Distance to Nearest Structure (parkland) in mi	Distance to Nearest Downwind Structure (parkland) in mi
OR1	0.2	0.2
OR2	0.4	0.4
OR3	0.2	0.6 (0.3)
OR4	0.1	0.1
OR5	0.0 (0.3)	0.0 (0.3)
OR6	0.2	0.2
OR7	0.2	0.2
OR8	0.1	0.4
OR9	0.1	0.1
OR10	0.0 (0.1)	0.0 (0.2)
AC1	0.3	0.3
AC2*	0.2	0.4

*as of 1961

Source: Enviro Control, Inc., 1975

The second factor is the location of the sensitive receptors. Receptors farther from noise sources receive less impact. Increasing the distance or presence of noise barriers between the noise source and receptor are effective ways of minimizing noise impact. These are the evaluative criteria to be used here for the assessment of noise impact.

The same considerations would be applicable to the study of odor problems. Sources of odor, location of sensitve receptors, prevailing wind direction, atmospheric stability, and the topographical influence on the wind field are essential factors for odor problem assessment.

The water quality data in the study area are limited. Most of the water quality data do not tell whether they were taken during the day or night. At night, respiration and the absence of photosynthesis can deplete dissolved oxygen more severely than during the day. Too few field observations prevent any statistical analyses. This makes the comparison of the collected data with the stream water quality standards difficult, because some of the standards are statistical in nature. However, they serve some qualitative guide for the assessment of the water quality impacts.

The same limitation and uncertainty have to be reserved to explain the results of water quality computer modeling, which can nevertheless be a useful tool to depict the variation of water quality parameter with river reaches. Extending its uses beyond that would be erroneous.

Two assumptions have to be made in order to delineate the water quality effects resulting from alternative future actions. First of all, the Basin Waste Load Allocation Program is assumed to be effectively implemented so that the stream water quality standards as required by the stream classification can be achieved. The second is that the effluent quality of any pollution sources would be effectively regulated by the responsible authority to the extent that the best practicable waste treatment technology (BPWTT) processes allow.

In identifying the noise sources in the sewage treatment plant, the assumption is made that the only noise sources are the air diffusers and the mixing action in the aeration tanks. The other noise sources, such as pumps, exhaust fans, exhaust of generators would be fully enclosed and properly muffled so that the residual noise levels at the property line of each alternative site are less than the existing ambient noise levels.

In the case of odors, it is assumed that the influent wet wells, and pump building will be enclosed and that the exhausts will be treated with ozone to reduce odors. The sand filtration and sludge concentration buildings would be fully enclosed and ventilation exhausts would be equipped with activated carbon adsorption columns for odor removal. Therefore, the only possible sources of odors are the aerators and the clarifiers. Odors from the aerators usually are not strong and can be minimized by maintaining high DO levels in the aerator liquor. Odors from the clarifiers can be reduced by lowering weir drops.

e. Biological Considerations

The Olentangy River near the Franklin-Delaware County line supports a diverse and abundant benthic fauna and fish population, as indicated in Chapter 2.

Research evidence indicates that the fish in the area of the plant's outfall and downstream could be harmed by the concentration of discharged chlorine or ammonia under certain conditions. Appendix E discusses the biological impacts for each alternative. Chapter 4 and Appendix H address chlorine and ammonia impacts and mitigation in detail.

f. Institutional Considerations

Several other institutions have various responsibilities relevant to the proposed wastewater treatment plant to be located either in southern Delaware County or on various alternative sites. On the state level, the Ohio Environmental Protection Agency (OEPA), the Ohio Department of Natural Resources, the Ohio Water Development Authority, and the Ohio Department of Transportation are pertinent to the project. The most important institutions are local. They include Delaware County, Delware City, Columbus, Westerville, and Worthington. If the proposed project has an extended outfall in Franklin County near I-270, then Delaware County would have to obtain the Federal Highway Administration's permission to use rights-of-way.

The OEPA, created by Section 3745 of the Ohio Revised Code, is given comprehensive water resource management responsibilities. Following these responsibilities and acting under Section 6117.34 of the Ohio Revised Code, the OEPA upon complaint by the State Board of Health, has ordered Delaware

County to construct wastewater treatment facilities. Delaware County's Facilities Plan had been certified by OEPA before before it was formally sent to USEPA. If Delaware County's plans include any contractual agreement with another political entity for the joint usage or construction of any facilities, this contractual agreement must be approved by OEPA as stipulated by Section 6117.42 of the Ohio Revised Code. The Ohio Department of Natural Resources is inolved in the designation of scenic rivers and state endangered species.

The Ohio Water Development Authority was established in 1969 to help fund the wastewater and water management facilities of local communities. Delaware County is planning to use an OWDA loan to pay its 25 percent share of the proposed project.

The Ohio Department of Transportation may be relevant to the project. If the Delaware County plant is located at the proposed site, a mitigative measure would be placing the outfall along State Route 315 to its interchange with Interstate 270. This action would require the use of state rights-of-way and the obtaining of a permit from the Ohio Department of Transportation to do so.

The most relevant institutions to the proposed project are those that exist at the local level. The Delaware County Commissioners established on June 2, 1969 a County Sewer District under Section 6117 of the Ohio Revised Code. As a County Sewer District, Delaware County is also authorized to enter into contracts with other political entities for the connection of sewers or the point usage of sewage facilities. Also, under 307.15 of the Ohio Revised Code, Delaware County can contract with any municipality in its borders to assume full responsibility for providing sewer service to that municipality.

Both the Delaware City and the Columbus sewer systems are provided for by Article XVIII, Section 3 of the Ohio Constitution. This Article enable municipalities to "exercise all powers of local self-government" including the providing of sewer service. In addition, Columbus's City Charter specifically creates a sewer system to be operated by the city's Department of Public Service. The other local institutions which may be involved in the proposed project arethe City of Westerville and the City of Worthington in Franklin County. If the proposed plant is located at an alternative site on Alum Creek, an outfall can be placed in Westerville, provided Westerville agrees and leases the needed land to Delaware County. The City of Worthington would be involved in the obtaining rights-of-way for an extended outfall.

2. Franklin County - I-270

a. Overview

The proposed sites in Franklin County are located west of the Olentangy River near the I-270 outerbelt. They are designated OR-1 and OR-2 from south to north. These sites are being considered due to the recommendation of Dr. Carol Stein of the Ohio State Museum of Zoology who suggested in public hearing that the plant be constructed so as to empty into the Olentangy in Franklin County south of the northern loop of Interstate 270. The main intent was to place the effluent in the portion of the river which has already been biologically degraded through channelization and highway construction. While a precise location was not selected by Dr. Stein, we have selected two sites in open areas north and

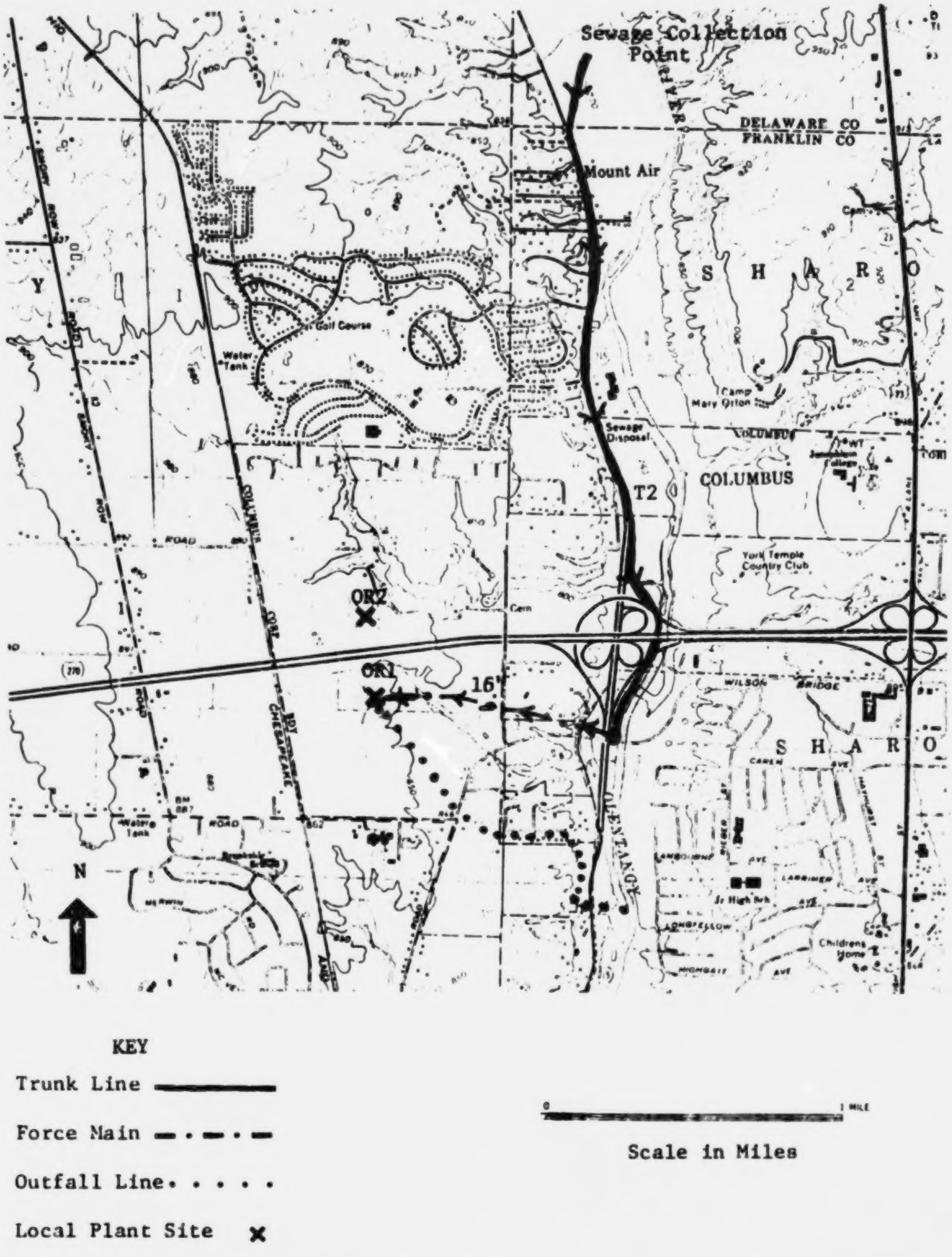


Figure 3-6. System Requirements for the Franklin County I-270 Alternative

Source: Enviro Control, Inc., 1975

south of the outerbelt, east of the Chesapeake and Ohio tracks. These are shown in Figure 3-6.

Site OR-1 is located south of I-270, east of the Chesapeake and Ohio tracks, north of Snouffer Road and almost a mile west of the Olentangy River. The available land is about 1/2 mile square. The elevation here is about 860 feet, or 100 feet above the river level. The grade in the site area, however, is not very steep. The site was set back from the river due to both residential housing density and steep slope near the river. The site was not located further south due to lack of available land outside the flood plain.

Site OR-2 is located immediately north of the previous site on the north site of the outerbelt. The area is bounded on the north by a forested area and a small stream. As such, it is smaller than the previous site, measuring only 1/4 mile on a side. The elevation is similar extending from 860 to 870 feet. This was the only site in this general area which was not obviously in an existing subdivision.

Most of the important characteristics of sites OR-1 and OR-2 are similar. Both are located at relatively high elevations, about a mile from the river. The effluent discharges from either location would be in the same river reach. The current land uses, however, are somewhat different. The necessary system changes from the basic plan here would include additional interceptor line in Franklin County, a pumping station, and an extended outfall pipe.

b. Site Selection

Site OR-1 is the preferred site in this group. Its selection is based on slight but important differences in engineering, land use, environmental and biological impacts. Institutional, political and legal considerations would be essentially the same since both sites are within the corporate boundaries of Columbus and the outfalls would also run through Worthington. Appendix E contains a detailed analysis of these alternatives.

3. Powell Road - Olentangy

a. Overview

The three sites on the Olentangy River near Powell Road are designated OR-3, OR-4, and OR-5 from south to north. They were originally suggested by Burgess and Niple, Ltd. in their Feasibility Survey and Report for Sanitary Service and Sewage Treatment Facilities (1970). All three have been subsequently discussed as the major three feasible alternatives in the Facilities Plan (Burgess & Niple, 1974). The southernmost site, OR-3, was chosen in the Facilities Plan, (see Figure 3-7 for site locations).

Site OR-3 is located on the west bank of the Olentangy approximately 1.2 miles south of Powell Road (Ohio 750) in Delaware County. The site is only 900 feet north of the Delaware-Franklin County line is on the lowest usable land within the county at an elevation of 770 feet above sea level. The site size is about 1/3 mile on a side. It is 0.2 mile from the nearest structure according to 1973 data.

Site OR-4 is on the flood plain or river terrace on the east bank of the river about 0.25 mile south of Powell Road. Elevation here is between 770 and 780 feet above sea level. This site is smaller than OR-3 and only has an area 0.2 mile square. It is about 0.1 mile from the nearest residence as of July 1975.

Site OR-5 is also on the east bank but to the north of Powell Road. It extends from the road northward for only 0.15 mile before being intersected by a small stream. In an east-west direction the terrain becomes very steep about 0.2 mile back

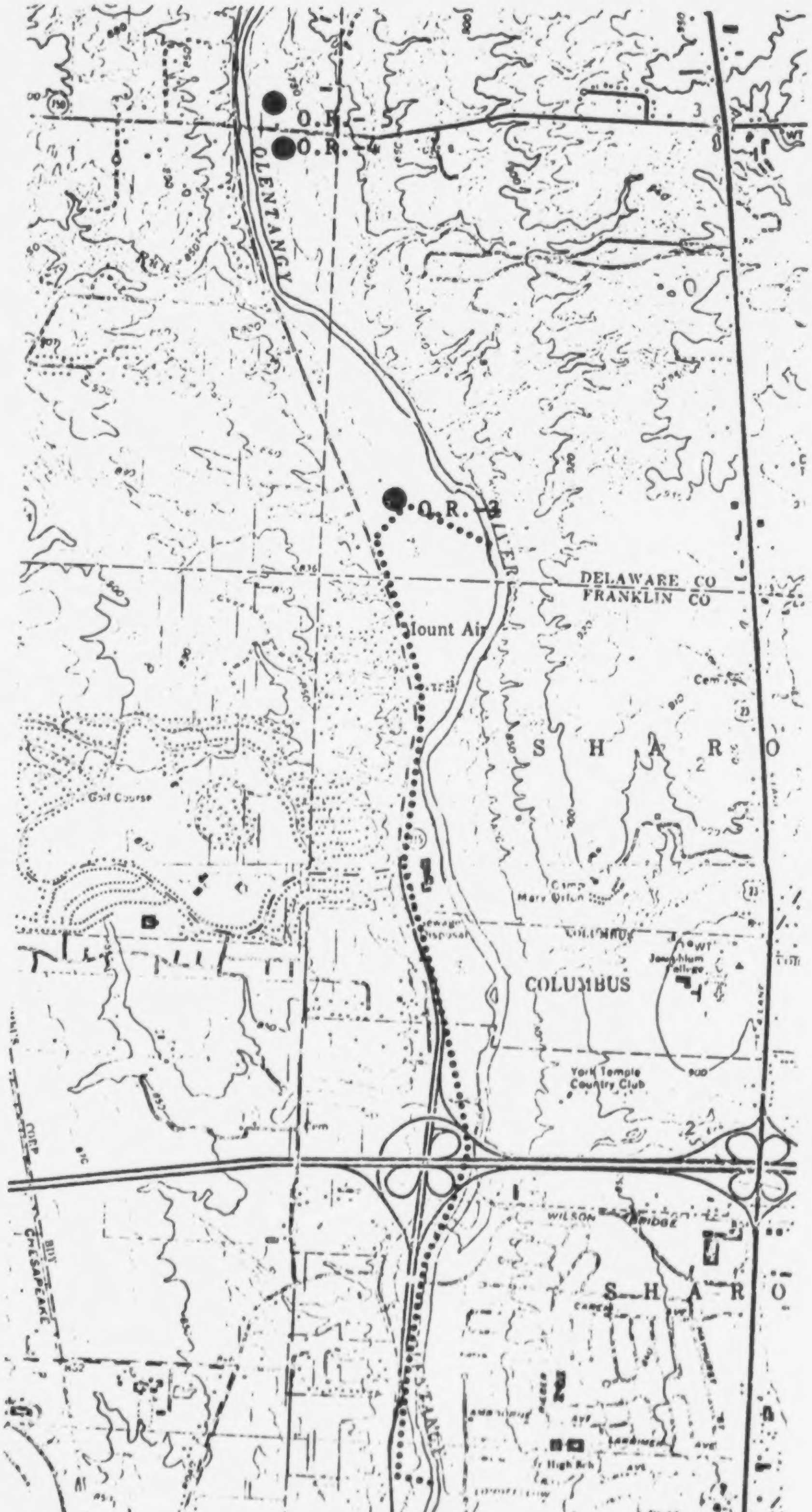


Figure 3-7.

Powell Road-
Olentangy Alternatives
and Outfall Route
Alternatives

from the river. The entire site is on steeper terrain than either OR-3 or OR-4, ranging in elevation from 770 to 800 feet. There is a residence on the site itself.

b. Site Selection

Site OR-3 is the preferred site in this group based mainly on cost, engineering considerations, and biological and other environmental impacts. Differences in land use impacts are deemed to be minimal between the sites. Institutional considerations are not a problem within the Delaware County Sewer District.

The major engineering differences between the three sites involve differences in line length, site size, and subsurface conditions. These last two considerations influence the ease and expense of excavation and other construction. The sites are equal in terms of pumping facilities and number of required river crossings.

We have selected site OR-3 as the best site in this group. The optimal course of action of locating the sewage outfall relatively downstream makes this site equivalent or better from a biological as well as an engineering standpoint. (The alternatives for an exact discharge point are discussed in Section F of this chapter.) Site OR-3 has slight advantages with respect to current land use and a slight disavantage with respect to aesthetic environmental impacts. Appendix E, Section 2 presents further information on these sites.

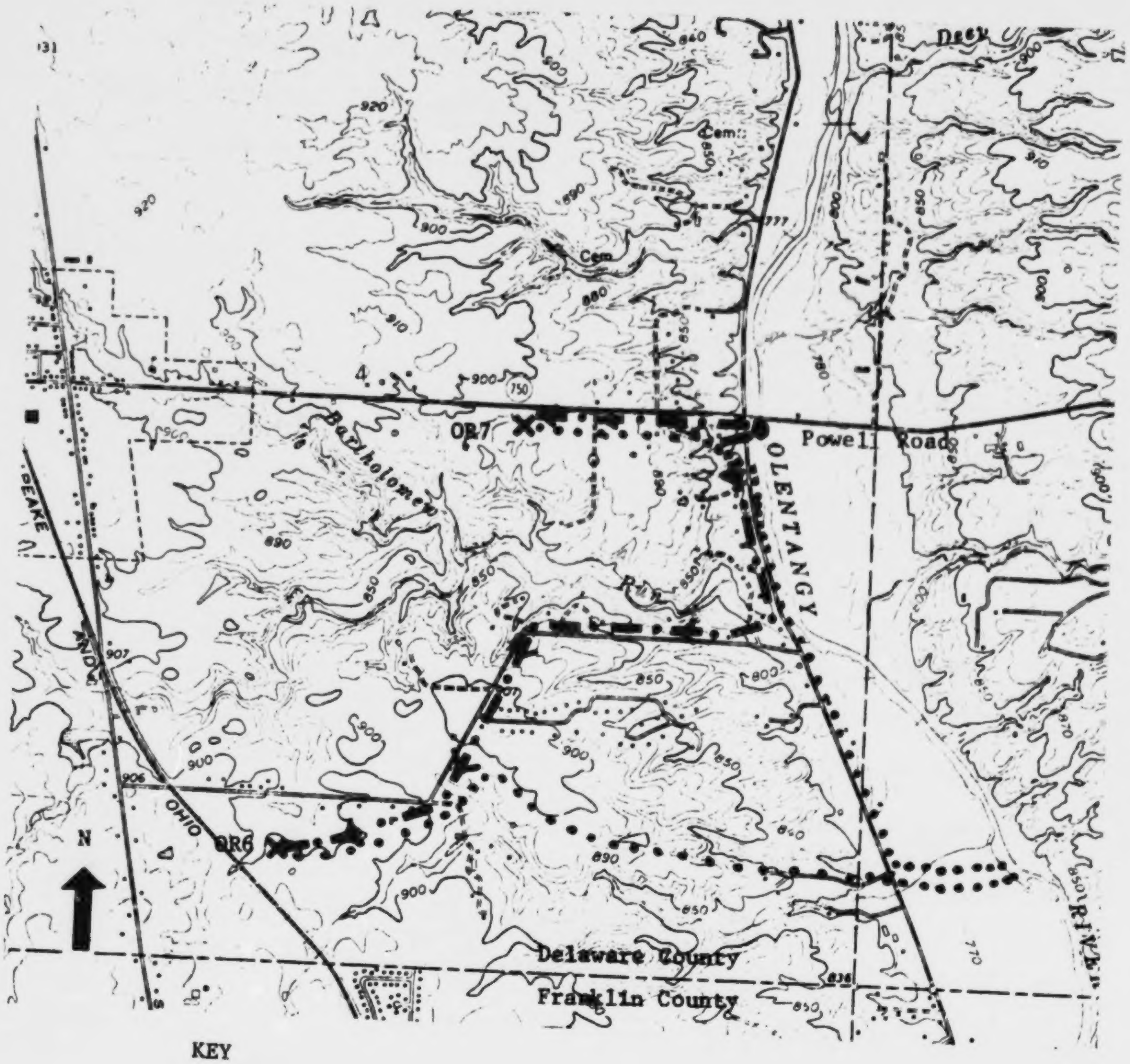
4. Powell Road - Powell

a. Overview

The two proposed sites near the Village of Powell are designated OR-6 and OR-7 from south to north. These sites are under consideration due to suggestions by Mr. Edward Hutchins, Director-Secretary of the Metropolitan Park District of Columbus and Franklin County, and Dr. Robert Teater, Director, Ohio Department of Natural Resources, that the plant be located on high ground 3/4 to 1 mile west of the river to minimize encroachment on Highbanks Park. We have selected one site (OR-7) adjacent to Powell Road which we feel is representative and fulfills the intent of removing the plant from the park vicinity. Burgess and Niple, Ltd. have selected a site near the county line (OR-6) to fulfill the same criteria.(See Figure 3-8 for site locations).

Site OR-6 is on land immediately east of the Chesapeake and Ohio tracks and immediately north of the Delaware-Franklin County line. We have determined that it would be advantageous to modify this location slightly by moving it 0.25 mile northward along the tracks to remove it from residences immediately south of the county line. There is about 1/2 mile square of available land. The elevation is about 900 feet on relatively level land.

Site OR-7 is located on the south side of Powell Road about 0.6 mile west of the Olentangy. The site extends 0.3 mile east-west and 0.2 mile north-south. It is immediately adjacent to Powell Road to the north and the forested area of Bartholomew Run to the south. The elevation is 890 feet.



KEY

Force Main ▬ • ▬ • ▬ •

Outfall Line. . . . . .

Local Plant Site ×

Lift Station ●

Scale in Miles

0 1 MILE

Figure 3-8. System Requirements for the Powell Road-Powell Alternative

Source: Enviro Control, Inc., 1975

The major differences in use of the two sites are engineering and cost considerations involving pumping requirements and force main length. Environmental factors which interact with these are biological impacts from sedimentation and noise, as well as effects on planned land use development in the area. Relative land use impacts are also a consideration.

b. Site Selection

Site OR-7 is the preferred site in this group. The differences between the sites, however, are relatively minor. Engineering and cost differences are the main factor in favor of Site OR-7. Although some land use and biological considerations argue against this selection, they can be largely corrected by proper mitigative procedures. Environmental influences are nearly identical and it is again not necessary to consider institutional aspects extensively.

With respect to land use, however, Site OR-7 is at a disadvantage. The site is near the center of one of the four major development areas in the recently completed plan for the Village of Powell (Lando and Bohm, 1975). Placement of the plant at this site would necessitate some changes in the Powell plan. Land use in the area is presently unintensive and a slight modification to the plan should not cause any major long-range problems. Another factor is that Site OR-6 is adjacent to a rail line and hence is an area with greater industrial development potential than Site OR-7. The plant would be more compatible with this type of use than with the residential uses planned for OR-7.

sites. Visual impact, odor, and noise are equal, since housing densities near both sites are the same. Neither site would impact on recreational or other sensitive areas. Water quality would be similar, but the biological impact of water quality changes would be more extensive at Site OR-7 unless a mitigative outfall relocation was used.

Site OR-7 would have some biological impact on the nearby forested scenic ravine at Bartholomew Run. This impact would include noise disturbance and sediment runoff, mostly during construction. Site OR-6, on the other hand, is within 1/2 mile of a small creek and woods area near the county line. While little noise impact would be expected, sediments could still be important here. Sediment problems could be avoided at both sites by use of proper construction procedures. See Appendix E, Section 3 for further analysis of these sites.

5. Stratford - Olentangy

This section evaluates three sites on the Olentangy River south of the town of Stratford. These sites were first proposed to accomodate a regional facility combining the service areas of Delaware City and southern Delaware County and may be seen in Figure 3-9. All of the sites are poorly suited geographically for use in treating the southern Delaware County area alone. In addition, since these sites were first proposed, (Burgess and Niple, 1970) the Del-Co water company supply intake has been constructed about 2.5 miles south of Site OR-7. The use of any of these three sites would involve either outfall relocation or relocation of the drinking water supply intake. Sewage would have to be pumped uphill from the downstream collection point. Because of these problems, these sites have presently little to offer as alternatives and are eliminated here from further discussion.

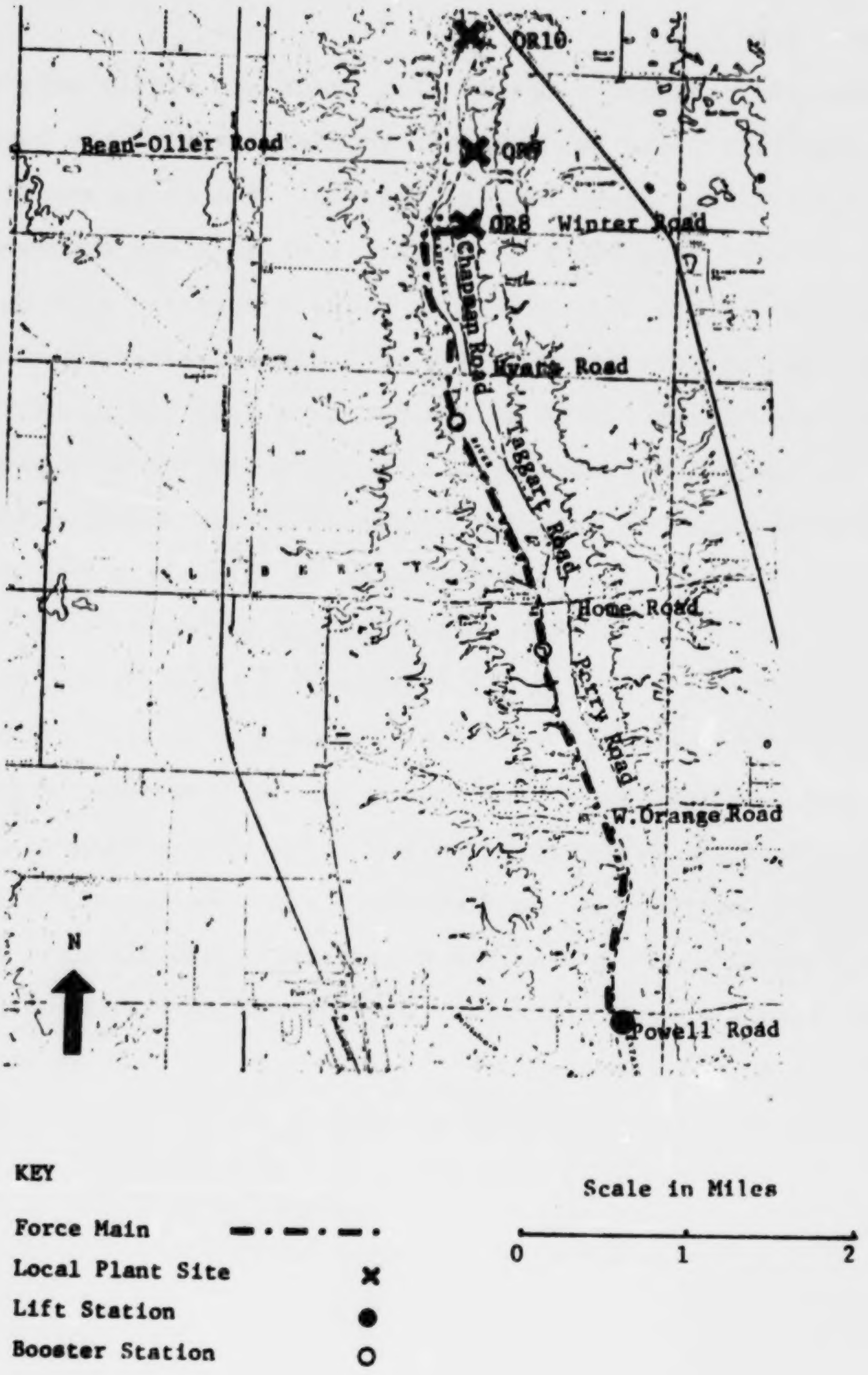


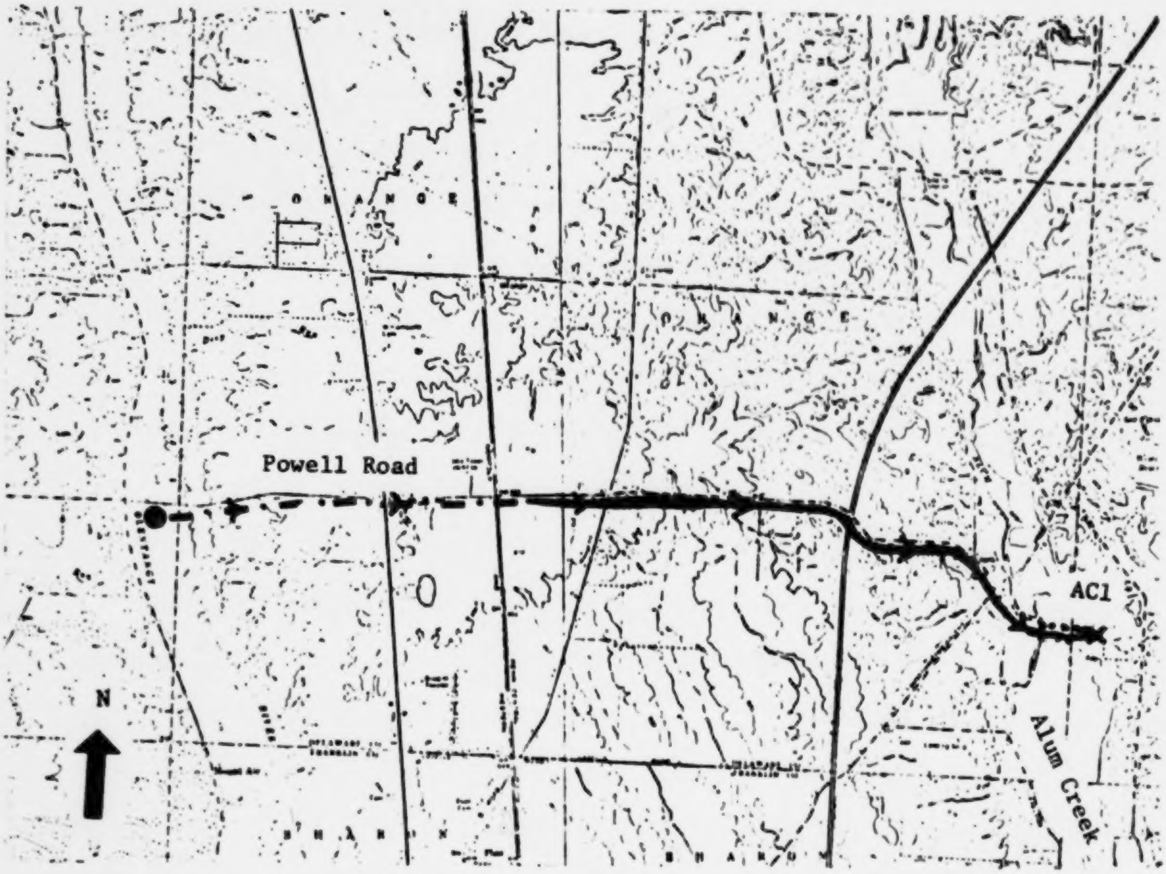
Figure 3-9. System Requirements for the Stratford-Olentangy Alternative

Source: Enviro Control, Inc., 1975

6. Alum Creek

The two proposed sites on Alum Creek are widely separated geographically, one being in the southern part of the county and the other in the north near Killbourne. The sites are designated AC-1 and AC-2 from south to north. Site AC-1 was suggested by Burgess and Niple Ltd. (1974) as being a possible site on a basin other than the Olentangy. Site AC-2 was suggested by Finkbeiner, Pettis and Strout (1969) as a site for a 1.25 MGD plant to service the northern Alum Creek Area. Since the time of this proposal, Alum Creek Lake, an intended recreational and drinking water source, has been constructed downstream from the site. This eliminates site AC-2. Site locations are indicated in Figure 3-10.

Site AC-1 is located 0.3 miles east of Alum Creek, and 0.9 miles north of the Delaware-Franklin county line. It is across the creek and 0.6 miles east-south-east of the intersection of Powell Road and Worthington-Galena Roads. The available land that is clearly above the floodplain measures 0.4 miles east-west by 0.5 miles north-south. The elevation is 820-840 feet or 15-35 feet above normal creek water level. The grade here is rather flat and there were no buildings or forests on the site in 1973. Distance to nearby structures is shown in Table 3-2. Appendix E, section 4, contains a more detailed analysis of this site.



KEY

Trunk Line ▬▬▬

Force Main ▬ · ▬ · ▬ ·

Outfall Line· · · · · ·

Local Plant Site ✖

Lift Station ●

Figure 3-10. System Requirements for the Alum Creek Alternative

Source: Enviro Control, Inc., 1975

7. Other Basins

On the Scioto Basin, a site was proposed in 1969 by Finkbeiner, Pettis and Strout for a 0.50 MGD plant to service the northern Scioto Basin. This site is designated SR-3 to differentiate it from the regional site at the Columbus Southerly Plant (SR-1) and from the Frank Road Plant (SR-2) in Franklin County, which will both be discussed in Section I. Site SR-3 is located 0.5 mile south of the Ohio 198 bridge over the Scioto River near Radnor. Figure 3-4 indicates these sites.

Site SR-3 is not suitable for the presently proposed facility. Large amounts of additional force main and large numbers of pumping stations would be required. The cost in both construction and energy commitments would be prohibitive. In addition, the discharge would be into the Scioto only a few miles above the O'Shaugnessy and Griggs Reservoirs, which are primary drinking supplies for Columbus. This site will be removed from further consideration due to these extreme problems.

8. Delaware County - City of Delaware

The wastewater treatment plant for this alternative could be either the existing Delaware City wastewater treatment plant upgraded to the required capacity or a totally new plant located between the population centers of the two jurisdictions. However, the latter has been already eliminated from consideration.

This alternative (Figure 3-11) expands the existing treatment facilities at the City of Delaware. The Delaware wastewater plant was upgraded in 1974 and has a hydraulic capacity of 2.5 MGD. Additional improvements are being planned to meet existing needs. The plant uses contact stabilization process for

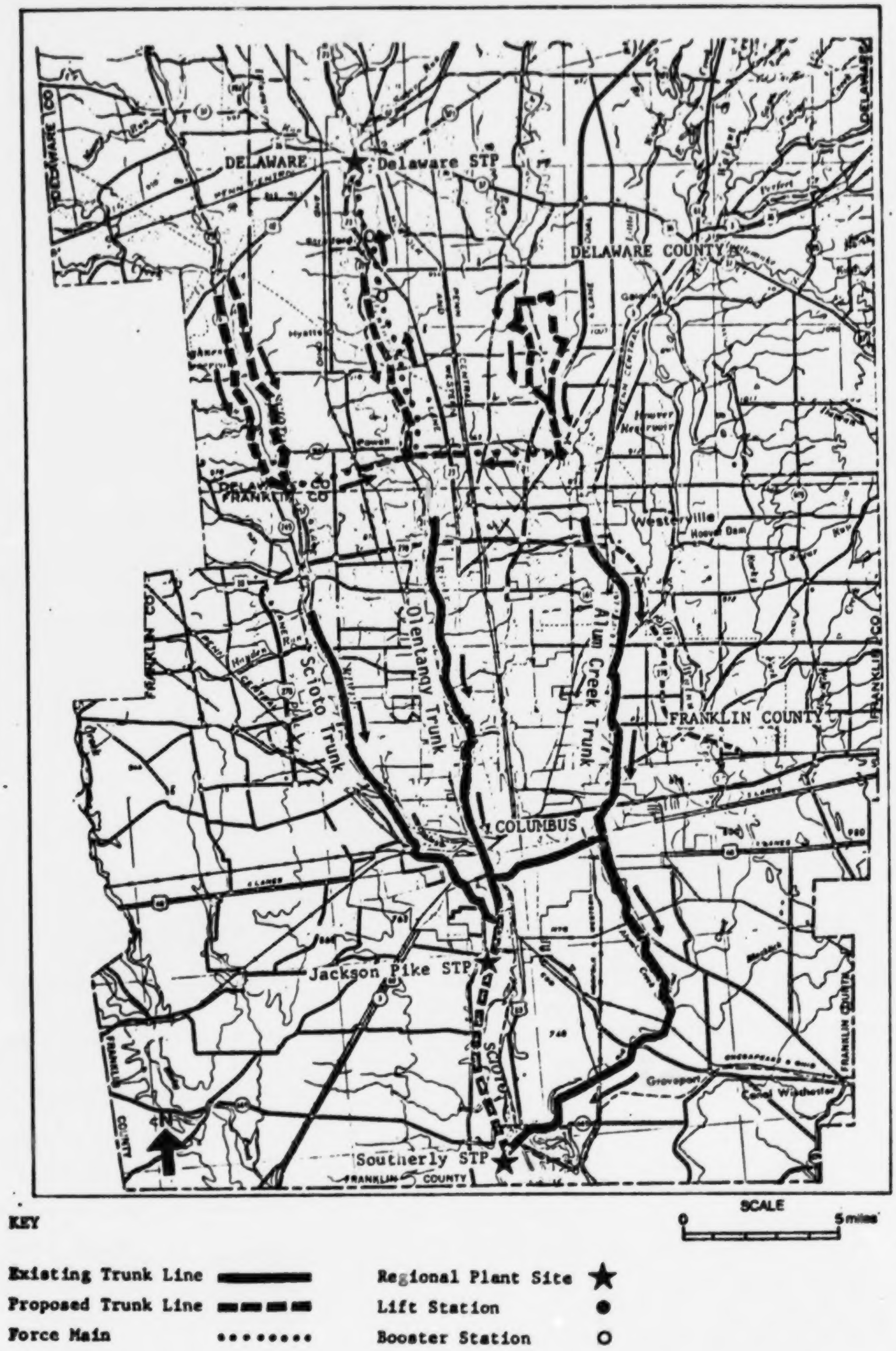


Figure 3-11 Delaware County-Delaware City Regional Alternative

Source: Enviro Control, Inc., 1975

sewage treatment, which is one version of the activated sludge treatment process. The concentrated sludge is consequently disposed of by sanitary landfill.

The system requirements for this subalternative are the upgrading of the plant components from 2.5 MGD to 4 MGD in the first year of the project, 5.5 MGD total in the 10th year, and 8.5 MGD in the 20th year of the project. A second stage of the activated sludge process with clarification, and dechlorination and post-aeration of the effluent would be added in the expanded plant to meet the effluent standards promulgated by the Ohio EPA. As Figure 3-11 shows, an additional force main 20 inches in diameter and 22,800 feet (4.3 miles) long would be needed to convey the Delaware County sewage from the Powell area to the plant. The two booster stations would be expanded in terms of system head of lift. The system head for each booster station would be 290 feet in order to overcome the frictional loss and the elevation differences.

The costs of constructing these force mains and of pumping the sewage, presented in detail in the Draft EIS, have eliminated this alternative. The Draft EIS estimated the present worth value at $27.6 million and the equivilent annual cost as $2.2 million.

9. Delaware County - Columbus

a. Overview

Six possible subalternatives are discussed here for the inter-county connection of sewer systems. Several of the subalternatives developed in the Draft EIS (#2, 3, and 4) have been eliminated from this discussion. The DEIS alternative two involved force main transport down the Olentangy River interceptor to the Jackson Pike plant. This was shown to be costly and the construction of a new sewer through central Columbus is also difficult. The DEIS alternative three routed all sewage down Alum Creek interceptor. This would involve extensive pumping, and capacity problems in the Alum Creek interceptor. DEIS alternative four proposed pumping sewage from the Scioto basin to the Olentangy while the Alum Creek load remained separate. The Alum Creek Interceptor has capacity limitations and the Scioto basin can be the most readily regionalized, as will be discussed below.

The new set of six regionalization subalternatives for Delaware County and Columbus are shown in Figures 3-12 through 3-17. Detailed sewer routings or designs have not been attempted. Treatment is at the Jackson Pike plant for the Scioto and Olentangy Interceptors, and at Columbus Southerly for the Alum Creek and Big Walnut Interceptors.

The first subalternative is equivalent to alternative one of the Draft EIS. The presently proposed sewer configuration would be retained, but the local treatment plant would be replaced with an interceptor connecting the system to the 36" Olentangy Interceptor in Franklin County. About 7600 feet of force main would be required. The terminus of the Olentangy Interceptor is 8 1/2 feet higher than the treatment plant elevation, requiring the use of a force main and lift station to interconnect the systems. Table 3-4 in section C presents cost approximations for this configuration relative to the other alternatives. The use of a force main for the Olentangy connection would reduce or eliminate the difficulties of elevation and narrow rights-of-way

Delaware County - Columbus Alternative

Subalternative 1

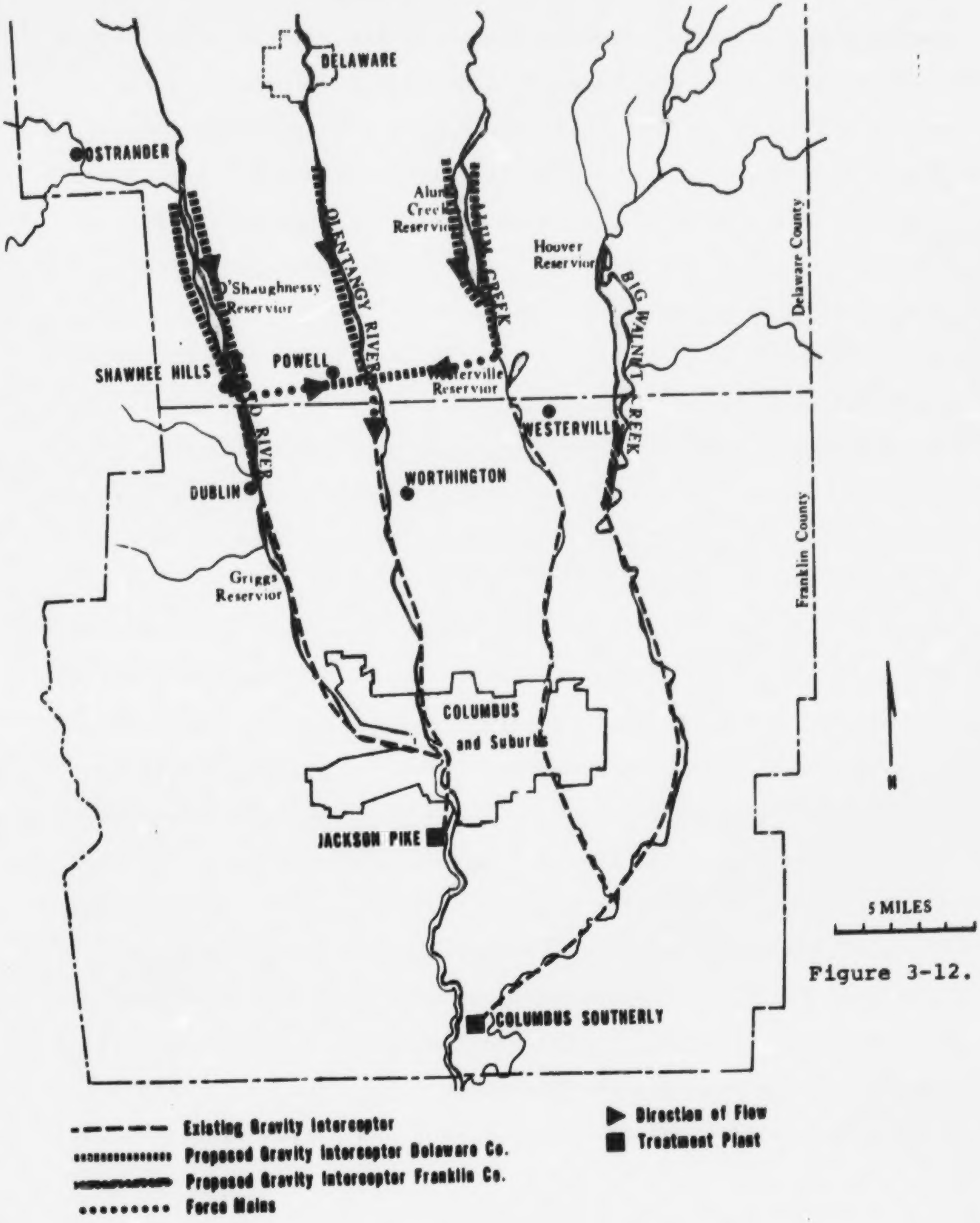


Figure 3-12.

Delaware County - Columbus Alternative

Subalternative 2

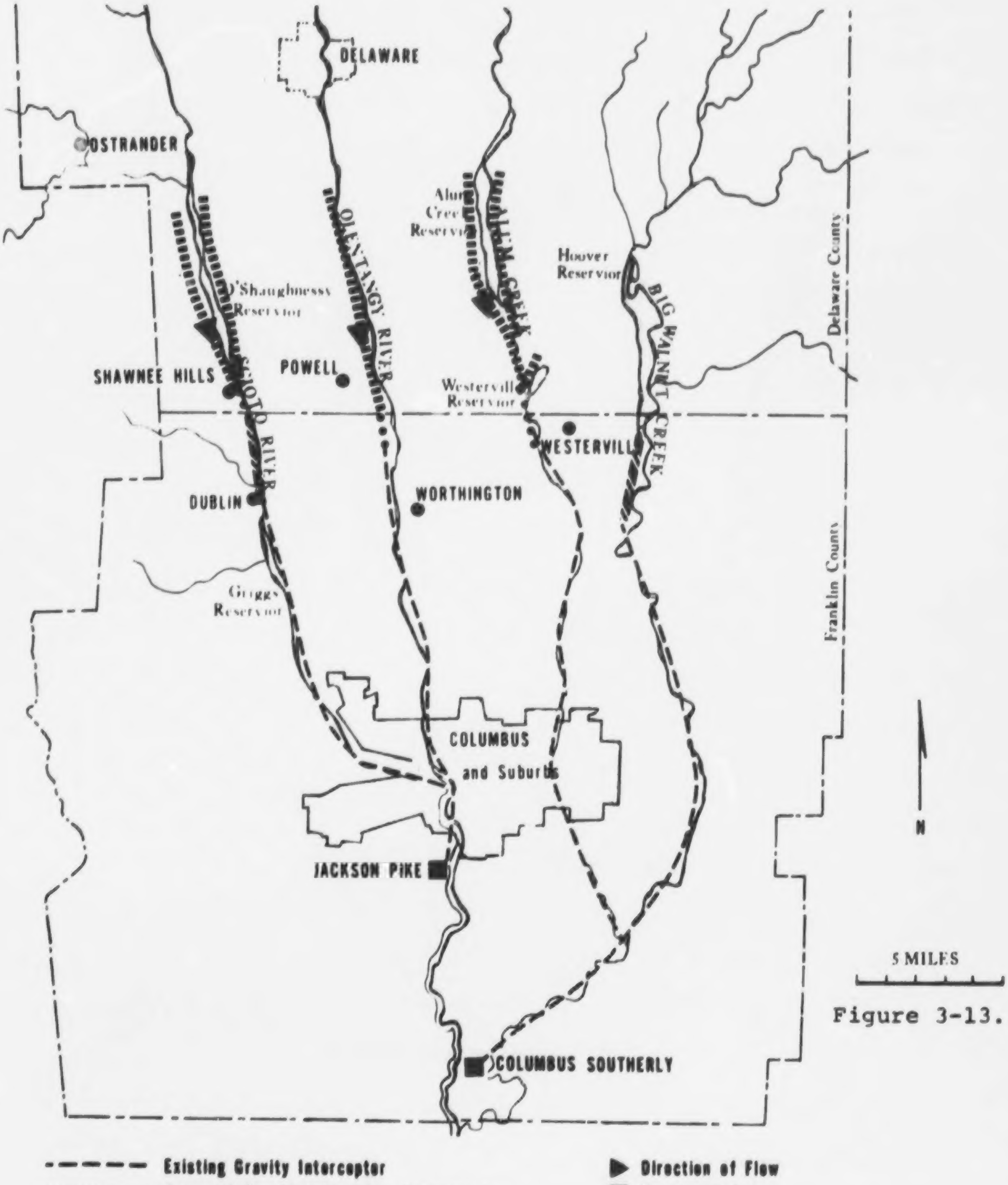


Figure 3-13.

Delaware County - Columbus Alternative

Subalternative 3

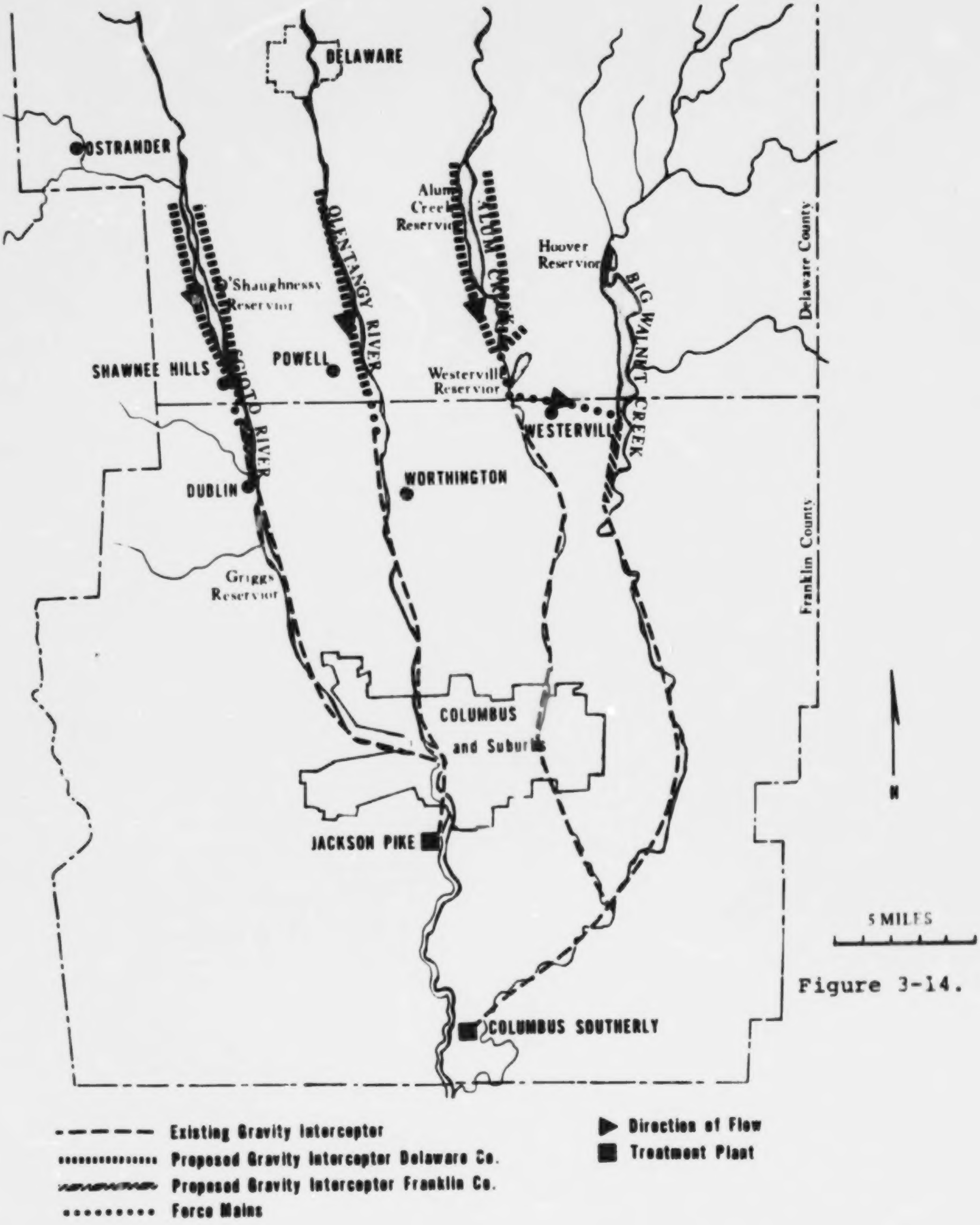


Figure 3-14.

Delaware County - Columbus Alternative

Subalternative 4

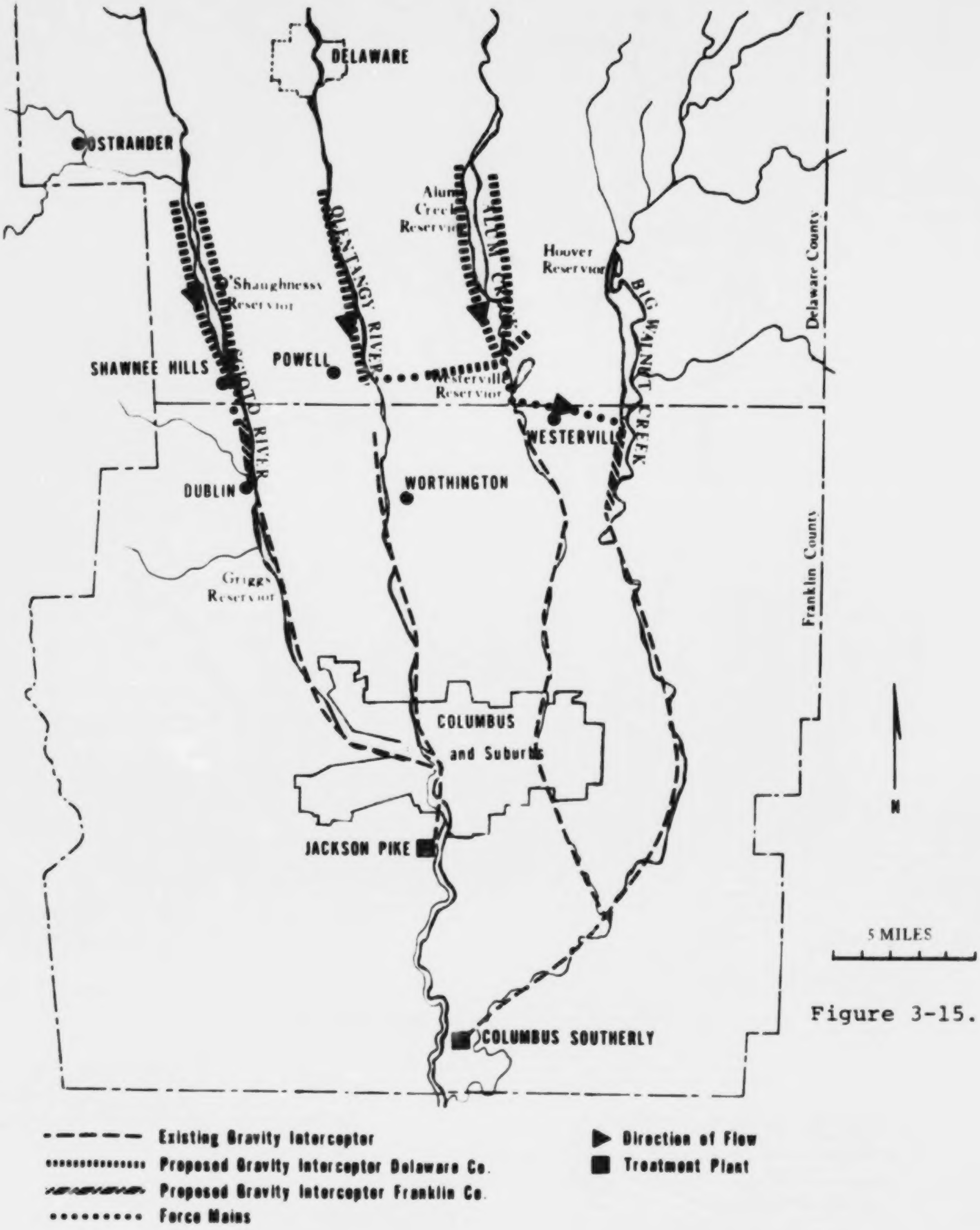


Figure 3-15.

Delaware County - Columbus Alternative

Subalternative 5

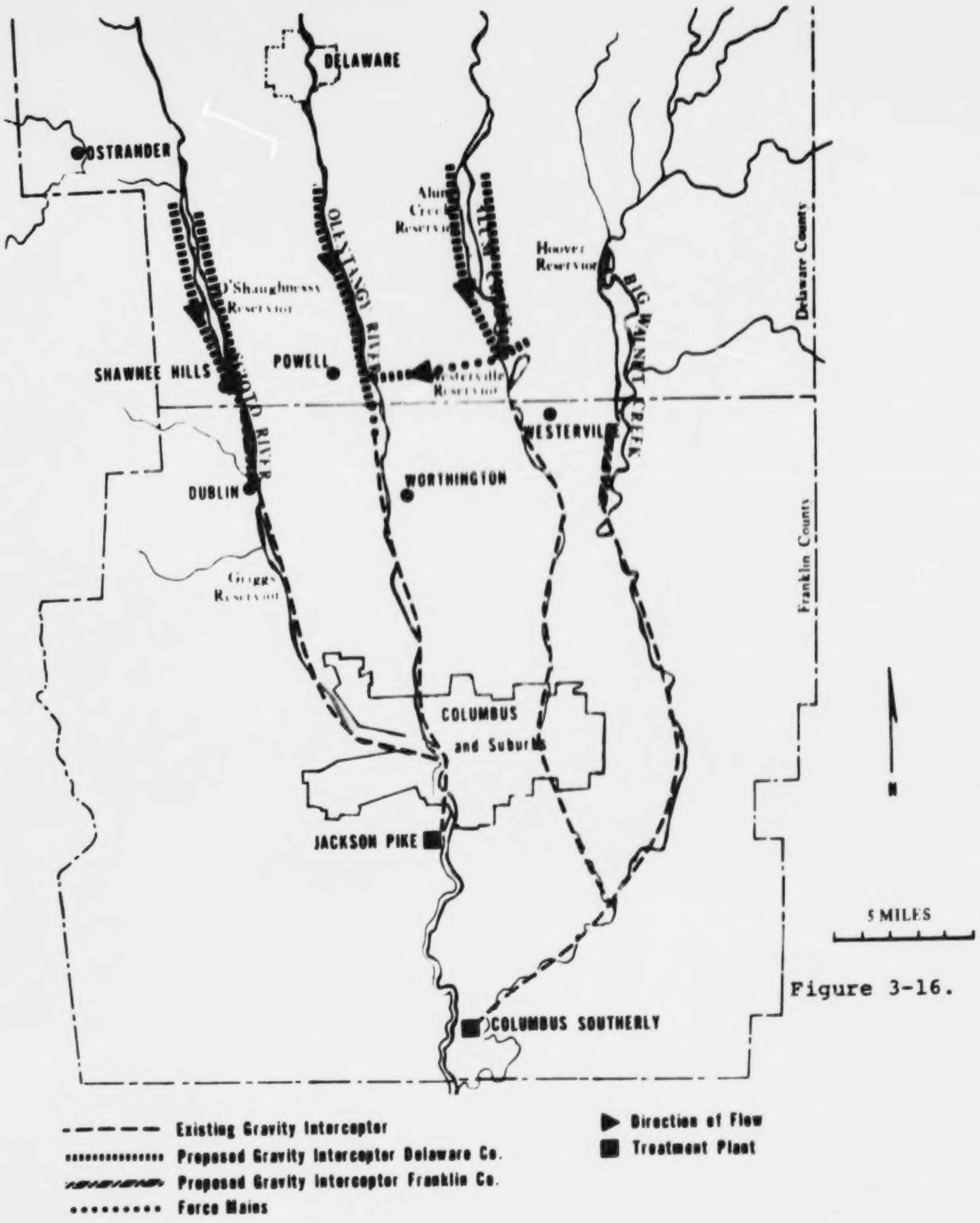


Figure 3-16.

Delaware County - Columbus Alternative

Subalternative 6

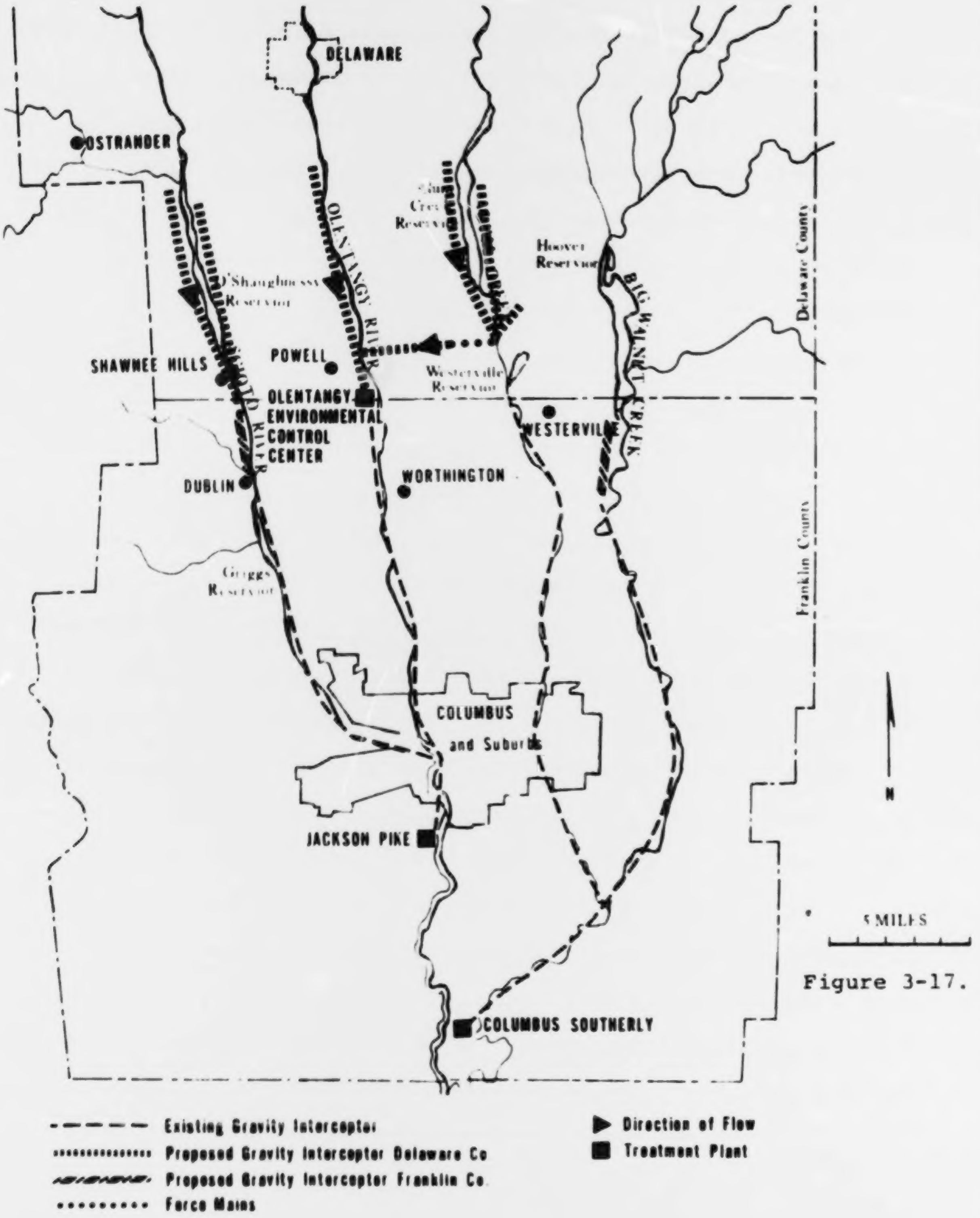


Figure 3-17.

encountered with the previous concept of using a gravity interconnection. Legal and institutional considerations will be discussed in a later section.

The second subalternative (comparable to #5 in the Draft EIS) utilizes each basin for transport to the Columbus treatment facilities. All force main transport between basins would be eliminated. Pumping would be necessary for the Olentangy basin sewer system, as discussed for subalternative #1. The Scioto interceptor is being planned to extend up to the Franklin-Delaware county line in the proposed Dublin, Ohio project. Pumping may be necessary in the Scioto basin, depending on sewer elevation. This would be for a very short distance, however. The Alum Creek basin would be connected via force main to the 36" sewer in Westerville and flow into the Alum Creek interceptor in Franklin County. This distance is about two miles from the basin's pumping station collection point, proposed in the Facilities Plan. The force main and lift station would be required because of the relatively high elevation of the sewer in Worthington and the relatively low collecting point.

Subalternative three regionalizes all three basins, as in subalternative two, except that the Alum Creek flow is diverted to the 84" Big Walnut interceptor, below the Hoover Reservoir in Franklin County. About 20,000 feet of force main will be necessary for this to accommodate elevation differences. The force main would be routed north of Westerville.

Subalternative four sends the Scioto flow directly to the Jackson Pike Plant, as in subalternative two. Both flows from the Olentangy basin and the Alum Creek basin would be pumped to the Big Walnut Interceptor. The Alum Creek - Big Walnut connection would be larger than in subalternative three. to handle the additional Olentangy flow.

Subalternative five again utilizes the Scioto basin regionalization connection. Alum Creek flows would be pumped to the Olentangy basin, which would be connected via force main to the Olentangy Interceptor in Franklin County, as has been previously described.

Subalternative six is comparable to subalternative five except that a treatment plant comparable to the proposed Olentangy Environmental Control Center will be built at site OR-3 to treat effluent from the Alum Creek and Olentangy basins.

Sewage flows are considered equivalent for all three basins in the Delaware County planning efforts (Gilbert, 1976). At the end of the twenty year planning period 3 MGD, or 1 MGD per basin, is anticipated to be generated within the service area. The ultimate design size for southern Delaware County, beyond the 20 year planning period of the Facilities Plan and the EIS, is 6 MGD or 2 MGD per basin. At 3 MGD the Delaware County flow is about 2.5% of the Jackson Pike plant flow, 3% of the Southerly plant flow, or 1.3% of their combined flows. A hydraulic interconnection has been proposed between the two facilities. Additional improvements for these facilities are proposed in the Columbus Facilities Plan, currently under study by USEPA in another EIS.

b. Sewer Capacity

The incremental sewage load imposed on either Columbus treatment facility by a regional alternative would not require present capacity upgrading of the treatment plants, since the peaking factors used in treatment plant design would be large enough to compensate for the small flows in question. In addition, the use of gravity sewers may permit the sewage to arrive at the treatment facilities outside of the peak flow periods from the Central Columbus area.

The four major interceptor lines of concern here in the Columbus Service Area are shown in Figure 3-18: the East Scioto Trunk, the Olentangy Trunk, the Alum Creek Trunk, and the Big Walnut Trunk.

An analysis of the Columbus trunk sewers was conducted by the Franklin County Regional Planning Commission and concluded in the Water-Related Facilities Plan in 1969. The study reveals that the infiltration and abuse allowance for sewer trunk design in the 1954 Plan (Franklin County Regional Planning Commission, 1954) are greater than those recommended in most engineering manuals and higher than those used in other cities. The first column in Table 3-3 provides, at various points, the actual sewer capacity in cubic feet per second for each of the major trunk sewers. Column "A" is the sewage flow at those points on the basis of the 1954 design criteria and 1985 distributed population. Column "B" is the sewage flow on the basis of the 1954 design criteria modified to reflect only those total acres that would be developed by 1985. Column "C" is the sewage flow at each point based on 1985 population distribution, with the peak flow factor applied only to the average sanitary flow.

The latter criteria modification reflects the approach in general engineering practice that design flow is equal to a factored sanitary flow plus an infiltration allowance. It is different from general engineering practice to apply a peak

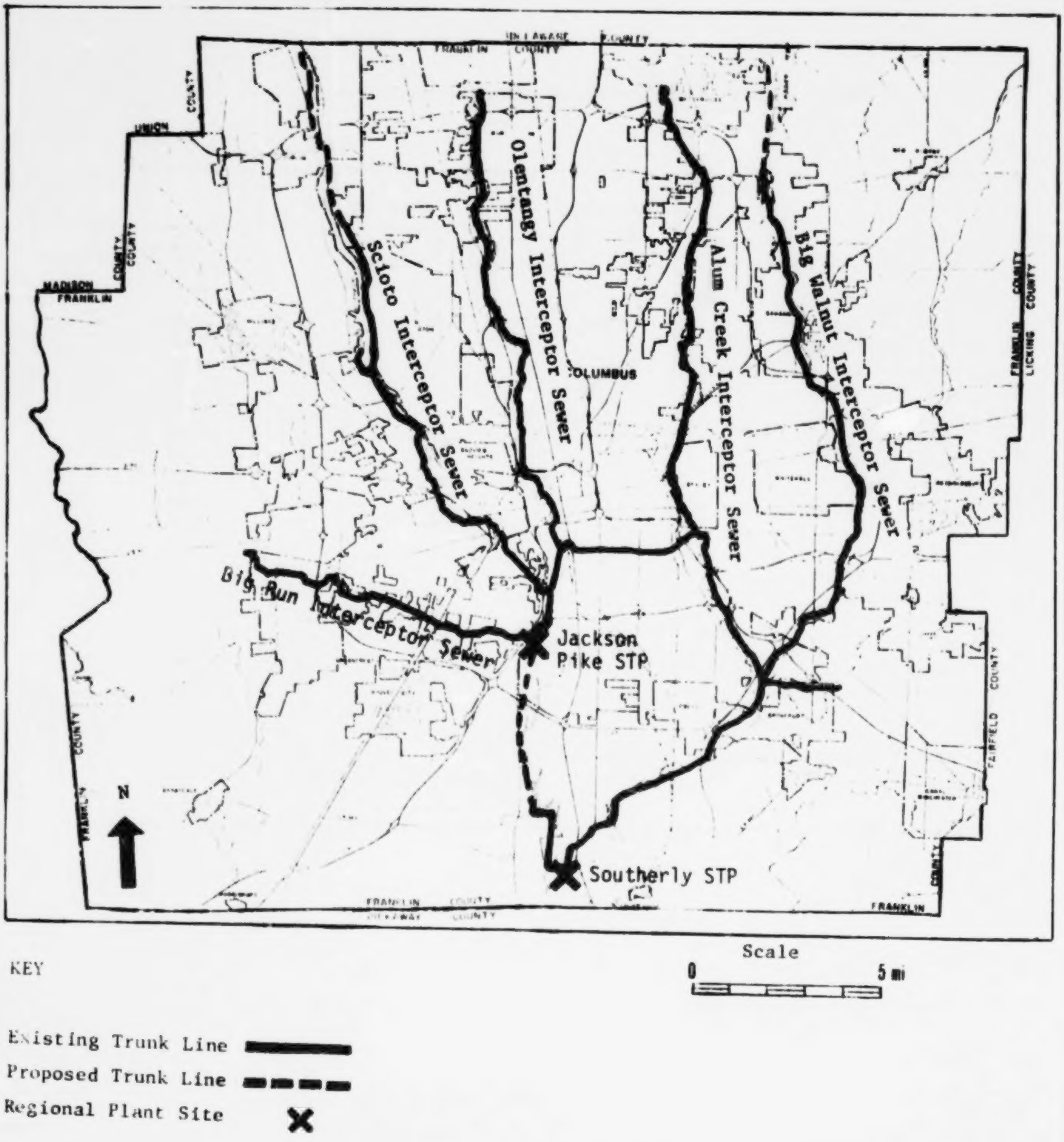


Figure 3-18. The Columbus Sewer Interceptor Trunks

Source: Adapted from Franklin County Regional Planning Commission, 1969

Table 3-3. Capacity of Columbus Trunk Sewers

Sewer	Capacity in cfs	Flow in cfs		
		A	B	C
East Scioto Trunk				
Bethel Road	33	44	30	28
Fishinger Road	52	60	45	42
Griggs Dam	155	180	105	125
Olentangy Trunk				
Outerbelt	48	35	28	22
S.R. 161	53	56	48	40
Morse Road	77	84	74	59
North Broadway	115	117	106	86
Frambes	184	139	128	106
Alum Creek Trunk				
Westerville	87	62	53	47
Morse Road	130	141	132	109
U.S. 62	205	200	191	159
Broad Street	205	231	218	189
Livingston Avenue	252	279	264	236
Big Walnut Trunk				
Havens Corners Road	190	117	85	82
U.S. 40	190	163	124	116
Outfall	290	217	173	164

Source: Franklin County Regional Planning Commission, 1969 flow factor to an infiltration allowance as is done in the 1954 criteria. The most generous allowance in the 1954 criteria might indicate that there is excess capacity available for additional service areas beyond the present service area, such as southern Delaware County.

As indicated in Table 3-3, the Olentangy and Alum Creek Trunks would be marginally loaded by 1985 populations under criteria "A" and "B", but would have excess capacity under criteria "C". The excess capacities of the Olentangy Trunk by 1985 would be 16 cfs (10.9 MGD) at Outerbelt I-270 and 23 cfs (14.9 MGD) at S.R. 161, more than that ultimately needed by southern Delaware County. The excess capacity of the Alum Creek Trunk by 1985 would be 30 cfs (19.4 MGD), which again would be more than what the southern Delaware County would need.

The Franklin County interceptors have been designed for an ultimate development capacity of 10 to 12 persons per acre within the county. Presently only areas in central Columbus have a development density that is this high.

The Infiltration/Inflow Analysis for Columbus (Malcolm Pirnie, Inc., 1975) has been approved by Ohio EPA and is currently under review by USEPA. This report indicates that the existing sewer system encounters capacity restrictions during periods of wet weather flow in the combined storm and sanitary sewer areas of Columbus study area 9 was combined and includes the Olentangy Scioto Interceptor Sewer (OSIS), which is the segment that connects the Olentangy and the Scioto Trunks to the Jackson Pike treatment plant. The construction of two 108" sewers is proposed in the infiltration/inflow analysis to correct this problem and to reduce sewer overflow The estimated capital costs for this improvement are $46 million.

Overflows from the Main Street Combined Sewer Area (Study Area 21), are proposed to be corrected by a new 108" interceptor from the Alum Creek Storm Stand-by Tank to the intersection of the Alum Creek and Big Walnut interceptors. This storage capacity will allow peak wet weather flows to be adequately dampened. Capital costs for this proposal are estimated at $10.6 million (Malcolm Pirnie, Inc., 1975). The rehabilitation proposals for other portions of the Columbus interceptor system are also presented in this document. These corrections will lead to a more effective control of overflow, and its subsequent pollution.

The amount of sewer capacity utilized by Delaware County flows in the regionalization subalternatives at the end of the twenty year planning period, would be 1.0 MGD per basin with higher peak flows. Initial flows would be considerably lower than 1.0 MGD.

Columbus has presented extensive plans for expanding its sewer system to serve Franklin County in its Facilities Plan, particularly in the Big Walnut basin.

Westerville's sewer system is presently being rebuilt to carry flows both by the Alum Creek Interceptor and the Big Walnut Interceptor. This has been done to avoid a downstream section of limited capacity in the Alum Creek Interceptor.

Dublin's present Facilities Plan proposes an interceptor from the city, on the west side of the Scioto River, extending up to the Muirfield Village development in Southern Delaware County.

A second barrel for the west side of the Scioto basin, up to Dublin, has been planned, but is presently encountering construction delays. In the meantime, the east barrel is used.

While the infiltration/inflow analysis for Columbus generally indicates existing capacity in the major Franklin County interceptors, (except for the combined sewer areas in wet weather), this type of report does not evaluate the future capacity of the system, but only its present condition. One variable for future capacity, already discussed, is the proposed correction of the major wet weather capacity problems of the combined sewer areas. Rehabilitaiton will occur in other selected portions of the system, as well. Another set of variables the rate of sewer extensions and the pattern of population growth within Franklin County, for which the system has been designed. This will determine the volume added to the present sewage flows in the various interceptors. Another variable is that the maximum downstream interceptor capacity may be reached prior to the full use of the upstream interceptor capacity, creating a downstream "bottleneck". Therefore, despite the generous initial design of the Columbus system discussed previously, these variables make it difficult to evaluate how long interceptor capacity will be available. This factor makes it questionable to plan for the addition of the total Delaware County flow to the Columbus system on a long-term basis.

c. Cost-Effectiveness

Capital costs, on a January 1975 bid basis, have been provided by Delaware County for the proposed Olentangy Environmental Control

Center, $3.4 million, and the Phase I interceptor network, $7.6 million. Present construction costs and any additional mitigative measures would add to these amounts. Capital costs for the six regional subalternatives will be based on a relative comparison with the basic system proposed in the Facilities Plan. Table 3-3 summarizes these relative costs for the local alternative at site OR-3 and the six regional alternatives. The component costs in Columns A through H have been detailed in Table 3-4. These capital costs were extrapolated from cost estimates for the Phase I interceptors and exclude costs for easements, road crossings, and overhead. Sewer easement costs will depend upon the length and route of the pipe. Land crossings will likewise relate to a particular configuration's length and location. Overhead is usually estimated as a percentage of the fixed costs, so it will be proportional. Operation and maintenance costs will be discussed shortly.
Each alternative in Table 3-3 has its required components indicated, and a total is presented at the right, which gives a relative cost-ranking. The majority of the interceptor system would be comparable for all of these alternatives so these basic costs are not included in this comparison.

On the basis of this comparison of estimated capital costs, the local alternative is clearly the most expensive. The next most costly plan is regional subalternative six which retains the local treatment plant, but omits pumping the Scioto basin effluent to the Olentangy basin. Subalternative two is least costly of all the regional choices. However, connection directly to the Alum Creek interceptor in Franklin county is presently impractical because of its downstream capacity constraint. The City of Westerville

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Table 3-4 ESTIMATED CAPITAL COSTS, REGIONAL ALTERNATIVES

Component (See Table 3-5)	A	B	C	D	E	F	G	H	
Alternative	cost: $3.4	cost: $0.6	cost: $0.8	cost: $0.2	cost: $0.4	cost: $0.6	cost: $0.9	cost: $1.1	Total in millions (excluding easements, roadcrossings, overhead, O & M)
Local OR-3	*	*	*						$4.8
Regional #1		*	*		*				$1.8
#2				*	*	*			$1.2
#3				*	*		*		$1.5
#4			*	*				*	$2.1
#5			*	*	*				$1.4
#6	*			*	*				$4.0

* Required.

Table 3-5 CAPITAL COSTS

Component	Item	Estimated Component Cost
A	Proposed Olentangy Treatment Plant	$3,400,000
B	Olentangy-Scioto basins: force main $182,000 lift station $400,000	$582,000
C	Olentangy-Alum Creek basins: force main $320,705 lift station $455,000	$776,000
D	Scioto basin connection estimate	$200,000
E	Olentangy basin connection: force main $130,340 lift station $400,000	$431,000
F	Alum Creek basin connection: force main $171,000 lift station $400,000	$571,000
G	Alum Creek-Big Walnut basins: force main $342,000 lift station $500,000	$842,000
H	Alum Creek-Big Walnut basins Larger size estimate	$1,142,000

is presently constructing additional sewers to divert part of its flow down the Big Walnut interceptor, to relieve part of the capacity burden on the Alum Creek interceptor. Subalternative five is the next most economical. It would involve sending one-third of the flow down the Scioto and two-thirds down the Olentangy. Using the Olentangy interceptor for two-thirds of the flow may stress the downstream interceptor capacity. Very close in cost is subalternative three, which overcomes the Alum Creek interceptor capacity problem by using the Big Walnut interceptor, instead. Subalternative one is next most costly, and would put the total flow to the Olentangy interceptor. This would be likely to cause capacity problems compared to dividing the flow between more than one basin. Finally, subalternative four overcomes the possible lack of capacity in the Olentangy interceptor by sending that flow plus that of Alum Creek to the Big Walnut interceptor, which is presently under-utilized. The Scioto basin flows would be sent to Columbus via that system.

Operation and maintenance costs are higher with the use of force mains, because of energy costs associated with the pumping. Pumping longer distances is more costly than pumping short distances, because of the need to overcome friction in a longer length of pipe. Hence, in Table 3-5 the more costly the componant (B-H), generally the more costly its O&M costs. This is because the more costly componants involve greater distances. The O&M costs for the treatment plant are presented in the Facilities Plan, assuming a 1.5 MGD plant for all twenty years of the planning period:

a) Years 1-5

  1) Constant O&M costs (total), $94,000
  2) Variable O&M costs, increase from 0 to $35,000 per year

b) ·Years 6-20

1) Constant O & M costs (total) $129,000
2) Variable O & M costs, increasng to $30,000 per year.

Operation and maintenance costs for the utilization of the Columbus treatment facilities would be reflected in the charges to sewer customers, which will be discussed in Chapter 4.

d. Environmental Effects

The regional alternatives employ the two Columbus treatment plants for part or all of the southern Delaware County flow. For all subalternatives except 6 the water quality impacts would occur in the Scioto River, as the receiving stream for the Columbus facilities. For these other five subalternatives, no direct water quality impacts due to the treated effluent would be identified in the Olentangy River. However, water diversion from the Olentangy would be an impact below the county line during low flow periods. This would be slightly reduced if the Del-Co water company uses stored water, and does not withdraw directly from the Olentangy during drought periods. Low flows make it more difficult to sustain downstream river ecosystems. At the same time, there will be no possible effluent pollution from a plant at the county line. Septic tanks will gradually be replaced by central treatment service with an improvement anticipated in the water with quality of area streams and reservoirs. Stream impacts on the Scioto river would be a minimal addition to the existing impacts. The flow at 3 MGD, in twenty years, will only be 1.3% of the combined capacities of both Columbus treatment plants, or 2.4% of their present combined dry weather flows. The present impacts to the Scioto from the Columbus treatment facilities is indicated in the water quality data for the

Scioto River, and in Appendix B. Both municipal wastewater treatment and other discharges contribute to the Scioto impacts. Chapter 2 also discusses the Scioto water quality issue. The present Environmental Impact Statement on the Columbus Facilities Plan will address these impacts in greater detail.

The gravity sewers in the regionalization proposals may permit the sewage flows to arrive at the treatment facilities outside of the Columbus peak flow times. The domestic sewage should not upset the biological treatment processes. Since existing sewage treatment capacity would be used, no additional noise, odor or aesthetic problems would be created.

Subalternative five combines impacts of the regional alternatives, above, with the impacts of local sewage treatment facility at site OR-3. One-third of the flows will be sent to the Jackson Pike plant and two-thirds of the flows will be treated on the Olentangy River within Delaware County.

e. Institutional Considerations

Four basic methods exist under Ohio law to permit the implementation of the regional subalternatives. Three of these involve the creation of a special intergovernmental district while the fourth provides for the use of contract between governmental entities.

In Ohio, three types of special districts are authorized to provide for sewage collection and treatment: a conservancy district (Chapter 6101, O.R.C.), a santiary district (Chapter 6115, O.R.C.), and a regional water and sewer district (Chapter 6119, O.R.C.). All three of these special districts are established through the filing of a petition in the court of common pleas. The petition establishing either a conservancy or a sanitary district must be signed by a governing body of an incorporated political subdivision within the district or by a substantial number of property owners within the district. The petition establishing a regional water and sewer district must be signed by the governing body of one of the counties, townships, or municipal corporations to be included in the district. Provisions are made for public hearings and for filing objections to the petition for each of the three types of special districts. The plans for improvements which each type of district would propose after its formation are subject to court review.

The use of a contract between Delaware County and Columbus would be more simple and direct than the establishment of a separate district (Sections 6117.41-.44, O.R.C.). Each party would be responsible for the sewers within their respective county. The contract would provide the necessary financial arrangements for implementing a regional system. The user charge system which is developed will require the approval of USEPA.

Regionalization between Southern Delaware County and Columbus has been discussed in 1969, 1973, 1975, and in the Draft EIS (see Burgess and Niple letter, Appendix J). Sewer capacity has been indicated as preventing regional sewage service on a long term basis.

The idea of "home rule" is very strong in both Delaware County and Columbus. This idea of local self-government includes an implicit belief that a political entity has the right and responsibility to provide sewer service and should not give up this aspect of self-government. Columbus feels that it first must use its sewer capacity to provide service to those areas of Franklin County which need sewer service before providing service to another county. As a semi-rural area Delaware County is conscious of its autonomy being threatened by the expanding Columbus metropolitan area. These attitudes would have to be surmounted before a regional alternative could be implemented.

10. Delaware County - Delaware City - Columbus

The existing Delaware Sewage Treatment Plant would be phased out by the 10th year of the planning period if this alternative is implemented. As in the Delaware County - Columbus alternatives Columbus Southerly and/or the Jackson Pike plant would be utilized as the regional wastewater treatment facility. The total sewage flow from the City of Delaware and southern Delaware County combined would ultimately average approximately 8.5 MGD (13.1 cfs).

The system configuration would be essentially the same as that indicated in Figure 3-1. However, the proposed Olentangy sewer trunk in Delaware County would have to be increased in size and would have to be extended up to the existing Delaware Sewage Treatment Plant site, which would be used as the sewage collection point for the City of Delaware sewer system and the downstream Olentangy flows. Regionalization interconnection alternatives would be similar to those discussed in the previous section.

This alternative is being eliminated because of the costs of phasing out the existing Delaware City treatment facility. All three entities, Columbus, Delaware County, and Delaware City would have to agree to this alternative, which would be more difficult than having regionalization decisions made by only Delaware County and Columbus, as previously discussed. In addition, this alternative would reduce the flow in the Olentangy River, an adverse impact during low flow periods. Sewer capacity in Franklin County would be a greater problems because of the greater volume of flow.

D. Treatment Process Alternatives

1. Treatment and Discharge to Surface Waters

A high degree of treatment is required for the proposed Delaware County facility to protect surface waters. The biological treatment alternative is a two-stage conventional activated sludge treatment process followed by tertiary rapid sand filters. Phosphorus reduction is also necessary and will be incorporated within this system. The overall facility would include comminution, raw sewage pumping, chlorination to control septicity, as necessary, first stage aeration tanks and clarifiers for carbonaceous biochemical oxygen demand (BOD) reduction, second stage aeration tanks and clarifiers for ammonia-nitrogen reduction, tertiary sand filters, either chlorination and post aeration, or ozonation, and sludge treatment. Facilities for feeding chemicals for phosphorus reduction would also be provided. Disinfection will be discussed in a later section. The treatment process is shown schematically in Figure 3-19. The initial size being funded is 1.5 MGD with a peak capacity of 3.4 MGD.

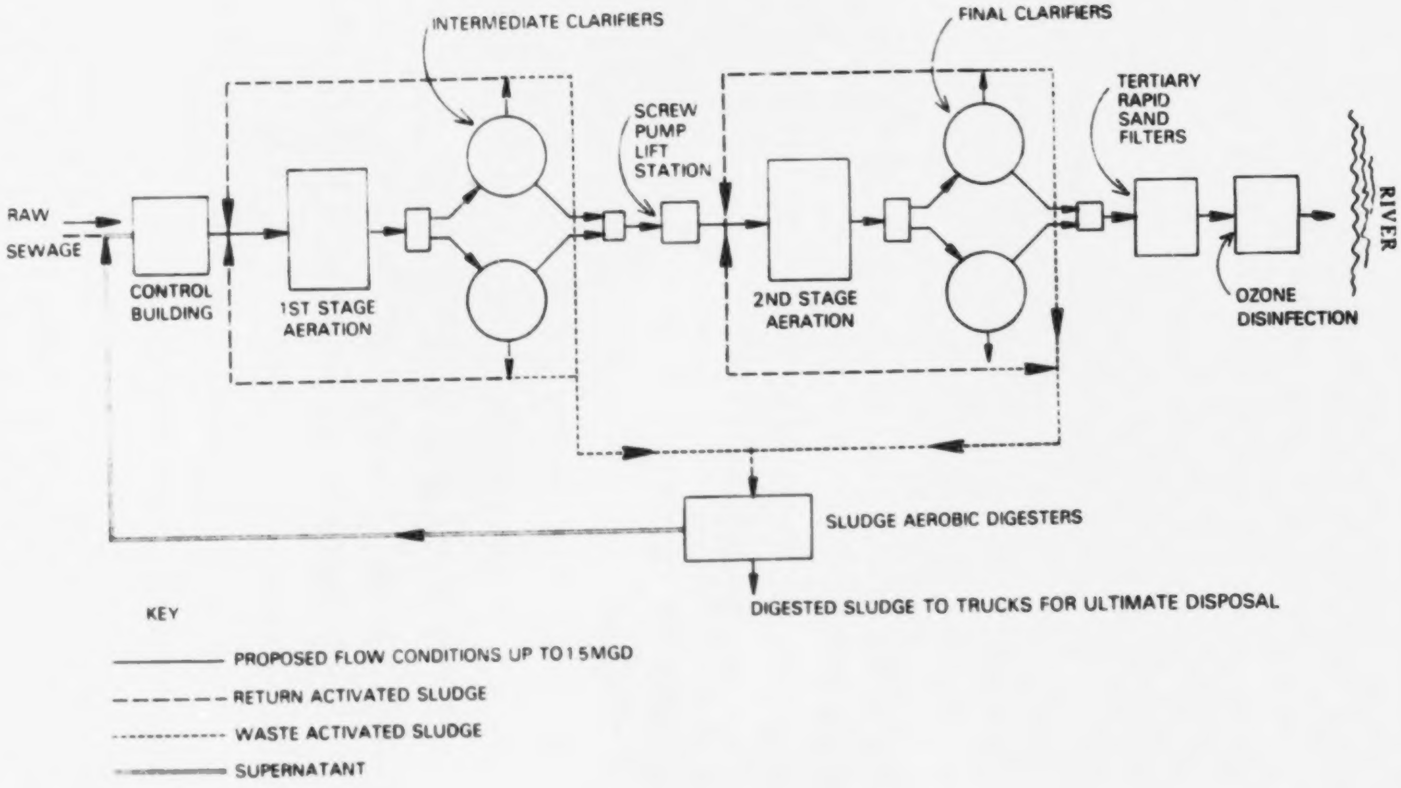

Diagram of the Proposed Sewage Treatment Plant 1.5 MGD

Figure 3-19.

Some regional treatment plant alternatives would utilize existing treatment facilities at Columbus. These facilities are described in detail in the Columbus Facilities Plan. The two major sewage treatment plants in Columbus are activated sludge facilities. The Jackson Pike Wastewater Treatment Plant currently treats a dry weather average daily flow of about 80 MGD and has a capacity of 120 MGD (Malcolm Pirnie, Inc. July 1975). The Southerly Wastewater Treatment Plant has a dry weather average daily flow of about 45 MGD and has capacity of 100 MGD. Each of the facilities consists of grit removal tanks, preaeration tanks, primary tanks, aeration tanks, final settling tanks, and chlorine contact tanks.

For southern Delaware County a 3.0 MGD plant, with peak capacity of 4.5 MGD, is anticipated by the end of the 20-year planning period. The population to be served by the facility is projected to be 28,591 by the end of 20 years. The plans for the initial 1.5 MGD plant are flexible enough to allow subsequent additions of whatever size is designed to meet growth needs. Ultimate ccapacity for the Delaware County facility is expected to be 6.0 MGD, after the 20-year planning period.

2. Wastewater Reuse

Wastewater effluent reuse for industry, such as cooling or quenching, or commercial activities, such as golf courses, sod production, Christmas tree production, or hay production, are local possibilities. However, the effluent quality required for these reuse considerations may vary along with the quantity that can be utilized. At present, there are no known potential industrial or commercial users available in south-central

Delaware County to reuse any wastewater effluent. In-home reuse systems, using water recycling or composting toilets have been discussed at the beginning of this chapter.

3. Land Disposal

Land for the irrigation apporach to land application requirements for moderately permeable soils, with good productivity when irrigated, would range from 62-560 acres per million gallons per day, plus buffer zones. Needed depth to groundwater is about five feet. Generally, the soils in Delaware County do not meet these requirements, as indicated in the County Soil Survey.

Due to the climatic conditions any irrigation would have to be combined with an overland flow approach or storage lagoon when the ground is frozen or when the irrigation approach is hampered by natural rainfall. The Soil Survey lists under irrigation soil features that the soils generally are of slow or moderately slow permeability with medium to high water holding capacity.

Secondary treatment plus chlorination, or its equivilent, would be required prior to land treatment by one of two methods:

a. disposal on the soil, with the impacts on groundwater not to exceed Federal Drinking Water Standards.

b. disposal on the soil, with underdrains and subsequent discharge of the effluent to surface waters, to meet discharge permit requirements.

The nearest suitable site for land disposal of sewage has been shown in Figure 2-1. The site lies northwest of the intersection of State Route 203 and Watkins Road, and would require force main transport of wastewaters from southern Delaware County.

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4. Additional Treatment Processes

More specialized treatment may be desirable to protect the surface waters with certain discharge alternatives to the Olentangy. They will be discussed in Chapter 4.

E. Sludge Disposal Alternatives

Three things must be done to the sludge before it reaches its ultimate disposal site: (1) The organic material in the sludge must be oxidized so that it will not create odors; (2) The pathogenic bacterial in the sludge must be killed; and (3) Most of the water in the sludge should be removed so that it can be handled economically.

There are a variety of processes used in treating sludge:

1. Thickening This process concentrates the liquid sludge by gravity or air floatation.

2. Conditioning Conditioning sludge produces dewatering when the organic material is broken down and water is released. This may be accomplished by chemical conditioning, biological digestion, or heat treatment.

3. Dewatering Water is removed from the conditioned sludge in this operation. Various methods for dewatering include vacuum filters, centrifuges, gravity dewatering units and filter presses, and sand drying beds.

4. Partial Disposal Incineration will oxidize all of the volatile solids in the sludge and produces an inert ash.

5. Ultimate Disposal Sludge may be spread on land or disposed in a sanitary landfill.

Plan A

Aerobically biologically digested sludge is applied to farmland in a liquid form. The sludge would be hauled from the treatment facility to farmland by truck. This land disposal of sludge has the advantage of recycling the nutrients contained in the sludge. Arrangements for farmland availability would have to be made for successful utilization of this alternative. A sod farm in Ostrander produces sod on layers of compost and sludge (Decker, 1975). Its president has expressed interest in utilizing the sludge generated at the proposed facility. The application site would have to be carefully chosen and monitored, to avoid possible contamination of groundwater from sludge components. Standby equipment would be provided so that sludge could be dewatered for hauling to a sanitary landfill during wet periods. Landfilling wastes the nutrient value of the sludge, however.

Plan B

Aerobically biologically digest dewatered sludge is applied to farmland. Transportation, land availability and nutrient cycling considerations would be similiar to those of Plan A. A sanitary landfill may be used for disposal when farmland is not available or frozen.

Plan C

Aerobically biologically digested sludge is disposed in a sanitary landfill. Transportation would be again by truck, but no arrangements for farmland are necessary. A suitable large and environmentally secure landfill site must be available. Nutrients would not be returned to productive use.

Plan D

This provides for chemical conditioning of sludge prior to incineration. Thickeners precede the vacuum filtration of the sludge and its chemical conditioning. A holding tank would be provided to store thickened sludge prior to vacuum filtration. After conditioning the sludge it would be incinerated and stored, before its ultimate disposal in an appropriate sanitary landfill. The exhaust gases form the incinerator could be a potential source of air pollution and nutrients would also not be returned to agricultural use.

Plan E

This provides for heat treatment prior to the incineration of the sludge. First, the sludge would be thickened and then it would undergo the heat treatment for conditioning. A gravity thickener would then concentrate the sludge further and also allow it to cool and depressurize. Relatively small vacuum filters would then be required to dewater the sludge prior to incineration, and the ultimate disposal of the ash would be in an appropriate sanitary landfill. This alternative may have an air pollution potential from incineration and ties up the nutrients in a landfill.

Composting

A cattle feeding operation in South Charleston, Ohio, is presently composting manure (Nottingham, 1976). This town is about 46 miles from the proposed treatment facility, on U.S. 42. Hauling costs would make this a less attractive alternative than land application within Delaware County. The only other existing area operation known to USEPA, Ohio EPA, and the

Delaware County Engineer's Office is in conjunction with the sod farm at Ostrander, mentioned previously as a potential sludge utilizer.

Regional

If a regional treatment plan were chosen, utilizing existing treatment facilities at Columbus, sludge would be thickened, digested, heat treated, vacuum filtered, and incinerated. Some of the sludge at Jackson Pike is anaerobically digested and disposed of in a landfill or stored at a lagoon. The Columbus Facilities Plan describes the facilities in greater detail.

F. Discharge Point Alternatives

1. Outfall Location

At treatment plant site location at OR-3, between the Olentangy River and Route 315, the discharge point proposed in the Facilities Plan is adjacent to the plant, immediately above the Delaware-Franklin County line. An additional alternative, designed to avoid the Scenic River segment, would be a location south of the I-270 interchange and below the artificial riffles area of the Olentangy. Figure 3-7 illustrates these two routes. Regional alternatives with Columbus would discharge at the existing treatment plants on the Scioto River.

2. Outfall Design

Several outfall designs may be considered for this project. Tsai (1971) studied the four types of outfall designs in Maryland, Virginia, and Pennsylvania, shown in Figure 3-20. Because Type I was located on one side of the river, its effluent mixed gradually downstream toward the opposite bank. Type II, located in the center of the river on the bottom, permitted mixing of the

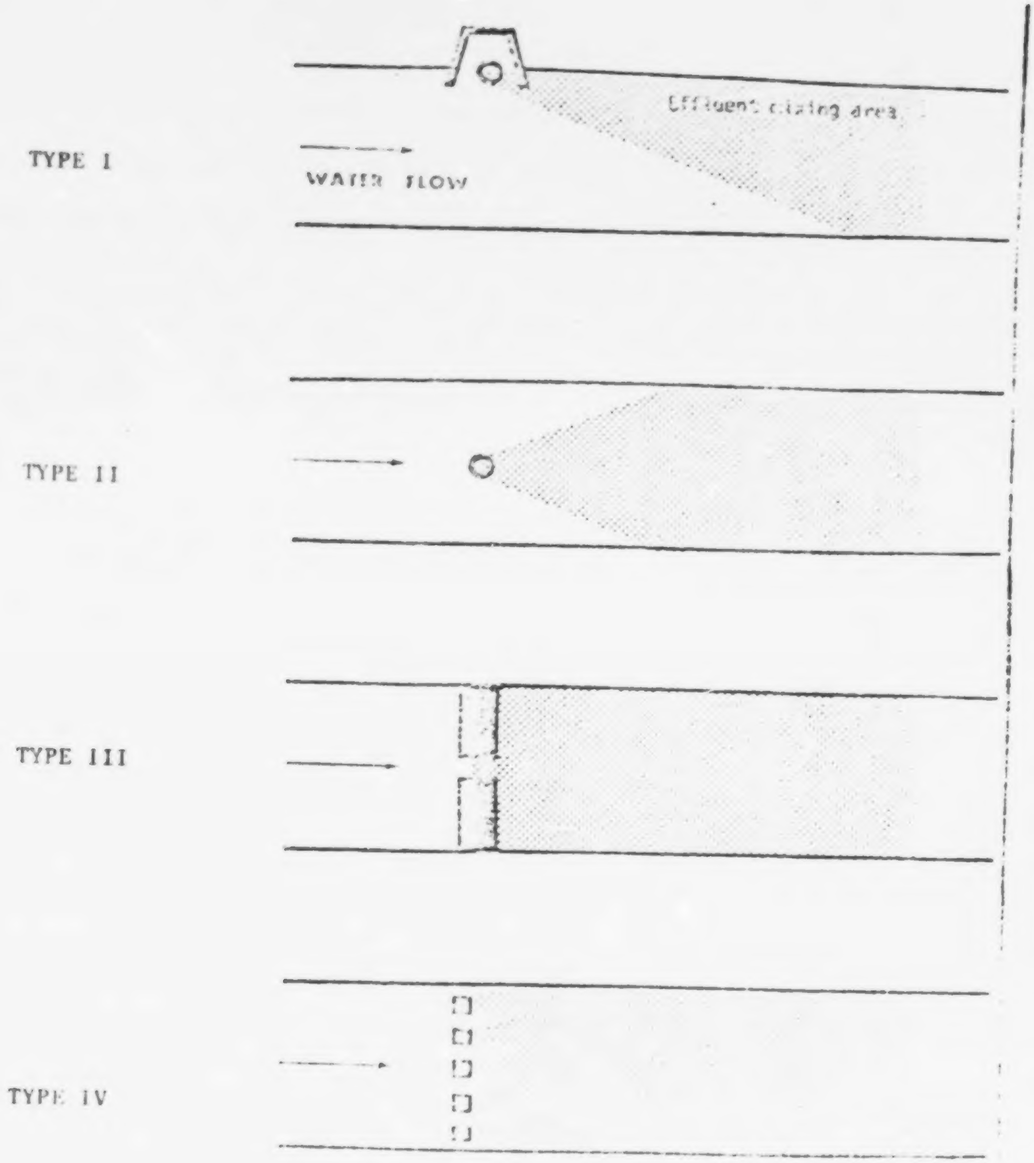

Figure 3-20. Sewage Outfalls Typed According To Locations and Methods of Sewage Dilution in Stream

Source: Tsai, 1971

effluent downstream toward both banks. Type III consisted of two concrete barriers, each built out from one side of the stream, allowing the sewage to discharge into the middle of the stream and providing for thorough mixing of the effluent. Type IV had multiple outlet ports across the river bottom. Tsai found Types III and IV to have higher dilution efficiencies than Type I.

G. No Action

The no action alternative would continue to utilize on-lot waste disposal systems--septic tanks and small aerobic package plants--in south-central Delaware County.

In October, 1974, the county adopted home sewage disposal regulations. One acre minimum lots are required for new systems. New subdivisions of more than four lots must have a central sewage collection and disposal system. Construction requirements are outlined for the various types of disposal systems. This should result in the construction of better functioning systems within the county, if the ordinanace is appropriately enforced. However, the older systems will remain in use within the county. Periodic maintance of all types of on-site systems is essential to their proper functioning. Federal funds are not available under Public Law 92-500 for upgrading or maintaining individual systems, so this alternative would be solely a local responsibility.

CHAPTER 4
FINAL SELECTION PROCESS AND DESCRIPTION OF THE PROPOSED ACTION

A. No Action

The no action alternative would result in the continued use of septic tanks and small package plants of variable treatment efficiency. Some continuing surface water pollution and nuisance conditions would be expected, due to the poor soil permeability for on-lot systems, and the generally poor reliability of package plants. Newly built septic systems should be more appropriate to local conditions, due to the recent stringent county septic tank ordinance. However, substantial water quality problems in the Olentangy River in the recent past have been due to loading from the Delaware City treatment plant above Powell Road. Consistent operation of their new facility and the planned upgradings will aid in improving water quality in the stream, particularly above Powell Road.

The county septic tank ordinance will encourage spotty patches of development on large lots, with four or fewer adjacent lots, unless the subdivision is served by its own package plant. Continued population growth would be expected to occur without central sewage treatment facilities, but probably at a slower rate.

B. Flow Reduction Measures

Utilizing flow reduction would have results similar to the "no action" alternative. In fact, increasing water use is anticipated in the area, from better availability, via the Del Co water system, and population growth in the area.

Home composting/reuse and grey water systems are not eligible for 75 percent federal funding.

C. Treatment Plant Sites

1. Local Alternatives

The local sites selected in Chapter 3 were:

- AC-1, on Alum Creek, near Powell Road
- OR-1, south of the I-270 Outerbelt
- OR-7, on Powell Road near Powell
- OR-3, on the Olentangy, above the County line.

Site AC-1 can be eliminated because of adverse impacts on Alum Creek. While Alum Creek Dam has the same guaranteed minimum release as the Delaware Reservoir, the average stream flows are less than the Olentangy. The Olentangy is the source for the surface water consumed in the service area and the use of site AC-1 would divert all of the effluent to another basin. Considerable additional pumping costs would be incurred to pump wastes from both the Scioto and Olentangy basins to Alum Creek. The outfall of the treatment facility would be above a water supply intake for Westerville, possibly polluting this water source. Creating a long mitigative outfall to a point below Westerville on Alum Creek would be costly and difficult because of the lack of a suitable state highway right-of-way.

Site OR-1 has the advantages of isolation from parklands and of discharging below the Olentangy Scenic River segment. Problems with this site include only temporary isolation from residential areas, and the necessity of setting up a new sewer district with a portion of Franklin County, with resulting legal and institutional complications. Extra expenses from additional sewer construction and uphill pumping would be incurred. A similar discharge point below the Scenic River segment could be utilized with other treatment plant sites, if desired.

Site OR-7 also has the advantage of being located away from the parkland view, and of being comparatively isolated from residential development, for the present time. It would require no modifications of the present sewer district. Considerable extra engineering and operating costs would be encountered from building force mains to pump the sewage uphill from the Olentangy Valley to the plant site, and for the longer outfall back to the river. Impact to water quality and aquatic life in the Olentangy would depend upon the exact outfall location chosen. Impacts of construction on the Barthlomew Run area could be negative, unless appropriate conservation measures were practiced. Isolation at this site, however, may only be temporary, as the Powell area expands. The site is located near one of the proposed activity centers of Powell's land use plan (Nitschke, Godwin, Bohm, 1974).

Site OR-3, selected in the Facilities Plan, is the basic site used here for engineering cost comparisons. It is generally isolated from residential land uses, but is directly west of the river adjacent to Highbanks Metropolitan Park. Existing river bottom trees, vegetation, and topography screen the site from the view from most parts of the park. Most of the site is likewise visually screened from the Highbanks overlook area. Maintenance of residential isolation would depend on future land use decisions relating to the conversion of farmland to suburban uses. Likewise, the future maintenance of the vista from the Highbanks overlook depends on these land use decisions. As with site OR-7, the impact on the Olentangy will depend upon the outfall location. Noise and odor from the facilities would be highly controlled at any of the sites chosen.

Of the local alternatives, OR-3 is the preferred one.

2. Regional Alternatives

In Chapter 3, regional alternatives involving Delaware County and Delaware City, and Delaware County, Delaware City, and Columbus have been eliminated. The remaining regional alternatives involve Delaware County and Columbus.

From the discussion in section C-9-c of Chapter 3, subalternatives one, two, and five may be eliminated because of the relatively high potential capacity limitations in the Columbus system. Subalternative three divides the Delaware County flows, but still must utilize the Olentangy interceptor which serves a highly developed area of Franklin County, and has the potential to develop capacity limitations. Subalternatives four would require considerable design work to evaluate the connection to the Big Walnut basin. Existing plans and specifications would need to be modified for Phase I to reverse flows to the Big Walnut basin. Coordination of flow volumes with Franklin County service area flows would be needed to ensure long-term capacity in the Big Walnut interceptor. Subalternative six is the chosen regional subalternative. Although relatively area. Maintenance of residential isolation would depend on future land use decisions relating to the conversion of farmland to suburban uses. Likewise, the future maintenance of the vista from the Highbanks overlook depends on these land use decisions. As with site OR-7, the impact on the Olentangy will depend upon the outfall location. Noise and odor from the facilities would be highly controlled at any of the sites chosen.

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3. Customer Costs

The following population table was recently compiled by the Delaware County Engineer's Office. Existing houses were counted from 1973 data.

Table 4-1. Existing Houses by Sewer Phases

	Phase I	Phase II	Phase III	Fringe Area**	Grand Total
Existing House	560	784	1,532	481	3,357
House Equivalent *	430	1,300	328	-	2,058
Subtotal	990	2,084	1,860	481	5,415
Building permits, 1973 to present ***					290
					5,705

* Flow of 400 gallons per day.

** Adjacent area to Phase III within the service area as shown on Exhibit 2 of the Facilities Plan.

*** Townships of Berlin, Concord, Genoa, Liberty, and Orange.

Phase I will serve 560 existing homes, an additional 40 new homes since 1973 (estimated proportionally), and the flow equivalent of another 430 homes, for a total of 1030 "houses."

Table 4-2 compares the costs to homeowners for sewer connection in the City of Columbus and in the Delaware County service area. The latter cost estimates are based upon system proposed in the Facilities Plan. Monthly service charges are additional, and will be discussed shortly. On-lot system costs are high in Delaware County because of the strict requirements of the recent septic tank ordinances.

The cost of the treatment plant estimated for January 1975 bids, based on the Facilities Plan system is $3,400,000, including an estimated $233,485 for mitigative aesthetic measures. The Phase I interceptor system cost is $7,647,000, for a total of $11,047,00 plus any other mitigative measures. The local collection sewer system is an additional cost to be borne entirely by Delaware County. The costs to the homeowner listed in Table 4-2 are also additional. Capital costs per existing house or house equivalent for Phase I of the local Delaware County system are:

	Total (100%)	Local Share (25%)
Treatment Plant	$ 3,301	$ 825
Phase I Interceptors	$ 7,424	1,856
	$ 10,725	$ 2,681

The per "house" estimate assumes that all 600 existing homes and the other institutional users, equivalent to 430 homes, are participating in the system. Section B-1 of Chapter 3 has discussed homeowner participation in the central sewage system.

Table 4-2. Relative Costs of Sanitary Sewer Service

Source: Delaware County Engineer's Office

	DELAWARE COUNTY			CITY OF COLUMBUS		
	Existing House	New House	On-Lot Septic or Aeration System	Existing House	New House	On-Lot Septic or Aeration System
Capacity Charge	$1,300*	$2,000*	-	$ 360	$360	-
Permit Fee	25	25	$ 100	25	25	$ 30
House Lateral**	500	500	-	500	500	-
Septic Tank Removal & Plumbing Changes	305 to 460	-	-	305 to 460	-	-
On-Lot Septic or Aeration System	-	-	2,500 to 3,200	-	-	800 to 1,200
	$2,130- $2,285	$2,525	$2,600- $3,300	$1,190 $1,345	$885	$ 800- $1,230

* Dependent on many different variables, such as project costs, interest rate, length of financing period, etc. This is the current amount projected on present estimated values of the many variables. For existing homes, the County plans to develop a method whereby a home owner may pay the capacity charge over a number of years.

**The house lateral (to be installed by property owner) estimate was made by evaluating the lengths of laterals required for the Parkmoor Subdivision. The longest lateral was 300 feet and the shortest 35 feet for an average length of 89 feet. The current estimate of cost for installation of a 6" lateral per lineal foot was estimated to be $5.25 for a depth up to 8 feet and $6.00 for depths of 8 feet to 12 feet (assuming average ground conditions). For example, assuming half the lateral at a depth of less than 8 feet and half with a depth of 8 feet to 12 feet, and a length of 89 feet $\left(\frac{\$5.25 + \$6.00}{2}\right) \times 89 = \$500.18$ results in a value of approximately $500.

Monthly service charges to the sewage treatment customer are planned to be about $15 per month in Delaware County. Columbus charges are based upon the metered volume of water use, rather than a flat fee. Household use levels would fall into the first monthly rate category of 25,000 cubic feet or less. Within the Columbus corporate limits in 1976 this cost is $4.78, for communities with contracts with Columbus, $7.17, and for non-contract communities, $8.37. Cost increases are foreseen in the future. This rate structure will be revised shortly to conform to EPA's user charge regulations. This will probably eliminate the price distinctions outside of the City of Columbus, unless they were based on cost differences associated with additional distance, or a related reason for extra costs. A billing mechanism from Columbus for the Delaware Couunty sewer district would have to be developed for any regional alternative chosen.

4. Comparison of the Local and the Regional Alternatives

The regional alternative is being selected because of its lower cost and its ability to provide more rapid service to a part of the Scioto basin with existing water quality problems. By adopting regional subalternative six, the Olentangy Environmental Control Center will serve the Olentangy and Alum Creek basins. The grant for the proposed first phase of the Delaware County system will be used to construct the 1.5 MGD treatment facility and Phase I of the interceptor system, which has been planned only for these two basins.

In the Scioto basin Step 2 planning may proceed via the

Dublin grant application, C391244-010, to prepare plans and specifications for an interceptor on the west side of the Scioto River in southern Delaware County to serve Muirfield Village and Shawnee Hills. Appropriate institutional arrangements will have to be implemented for Delaware County to pay for the local share of the interceptor segment within the County, and for treatment of its sewage flows at the Jackson Pike plant in Columbus.

At the present time there is no clear indications of whether or not the remainder of the Delaware County planning area within the Scioto basin would be best served by the Olentangy Environmental Control Center or by Columbus and the Dublin interceptor. Either of these alternatives may subsequently be determined cost-effective by Ohio EPA and USEPA. In any event, additional facilities planning elements will be developed by Delaware County at the time that sewer service in the remaining part of the Scioto basin planning area is desired. This analysis must examine the Scioto basin sewer capacity in detail. Delaware County has the responsibility to provide a level of treatment adequate to maintain water quality standards in the Scioto basin portion of the county whether or not regionalization of the remainder of its planning area is, in fact, feasible. In either event, flows from Shawnee Hills and Muirfield Village will continue to be served by the extension of the Dublin interceptor.

Interceptor Alternatives

1. Interceptor Phasing

The proposed Phase I of the interceptor system is desirable to protect drinking water supplies at the Westerville and Alum Creek Reservoirs. Package plants at recreation sites would provide only a temporary solution to the area sewage treatment needs. Furthermore, they would discharge directly into the reservoir and provide less reliable treatment than would the larger facility. Sewage treatment lagoons are also a short-term possibility, but would require larger amounts of land.

The present population of southern Delaware County is predominantly scattered along the major roads, rather than clustered in villages. As discussed in Chapter 3, this makes it very difficult to serve the existing population in an efficient manner. The Village of Powell is one population center adjacent to the proposed treatment plant site which could be served along with Phase I with a minimum of additional interceptor construction. However, the grant application to design the Powell interceptors is ranked too low on the Ohio priority list to be within present funding range. The Scioto basin sewers, proposed for Phase II in the Facilities Plan, must be modified to proceed earlier along the west bank, to Muirfield Village and Shawnee Hills, to implement the regional alternative. This should be accomplished through modification of the Dublin Facilities Plan.

2. Construction Alternatives

As discussed in Section B-2 of the last chapter, gravity sewers are preferred over force mains, whenever this layout is practical. Major pumping will be necessary to lift the sewage from the Alum Creek basins into the Olentangy basin. Pumping within the Scioto basin will be based on future engineering design work. Some force mains will be used around Alum Creek Reservoir to serve desired areas.

The location of the outfall sewer line will depend upon the choice made for the outfall site, as discussed subsequently in Section G of this chapter.

3. Stream Crossings

The interceptor configuration of the Facilities Plan has 3 crossings on Alum Creek (two in Phase I and two in Phase II) and 10 crossings of the Olentangy River (two for Phase I, two for Phase II, and six for Phase III). On the Olentangy, five of the crossings occur above Home Road and five occur at or below Home Road. These two areas are substantially different in both topography and the availability of highway rights-of-way. The topography below Home Road on the east bank of the river is much steeper than upstream and is interrupted by a substantial number of gulleys and small waterways. Shale lies near the surface in this area. It would be difficult and expensive to lay a sewer line entirely on the east bank in this area. Because there is no highway right-of-way on the east bank, it would be necessary to locate the sewer line through forested areas. Some damage to the wooded area would result. The five river crossings in this southern area are therefore justifiable insofar as both costs and adverse environmental impacts would be less than those incurred by the alternative of dual interceptors.

North of Home Road, however, the emplacement of an interceptor line along both east and west banks would serve to eliminate five river crossings with some additional impact on the terrestrial environment. The topography here is less steep than further downstream, and Perry, Taggart, and Chapman Roads could provide convenient rights-of-way for the line. With the use of two lines the required size of each interceptor would be less. However, this alternative would generate more sediment and erosion problems than would a single interceptor, and would be more costly. The stream crossings have also planned to enhance gravity flow. Therefore, we would recommend construction of the single interceptor.

The Alum Creek stream crossings are required for the desired sewer configuration. The Scioto crossing will depend upon the final disposition for servicing the east side of the basin. Rock in this area makes sewer construction difficult.

No information is available concerning aquatic life distribution on a fine geographic scale for the area streams. No particular short stretches of river are known to possess important habitat requirements compared to others. Therefore, recommendations for small changes in interceptor crossing locations cannot be made. The safest way to compensate for this gap in information is to reduce impact of the crossings through well-chosen construction phasing and techniques.

Well-planned construction phasing takes into consideration the adverse effects of construction sites on which work is delayed awaiting construction elsewhere. These delays usually result from attempts to reduce costs of mobilizing earth moving equipment by clearing all sites at once. Such a policy would result in an increased load of sediments and pollutants washed into the stream as well as onto adjoining farm, residential, or forested areas. The preferred phasing policy would call for completion of all construction phases on each river crossing site or on small segments of line construction before proceeding to the next section. This will prove more expensive in short-term costs but advantageous in the long run because it would minimize pollution runoff and lengthy habitat disturbance.

Stream crossing construction techniques may involve diversion or partial diversion of the river. Total diversion of the Olentangy River or of Alum Creek would be unwise and unnecessary due to the lack of a suitable diversion course and the low water volume in the river. Other possible techniques involve dredging, which causes extensive sediment problems, boring under the riverbed, which is costly and disruptive because of a large construction area, or partial diversion with temporary impoundment.

Diversion of half of the river at a time is the method recommended for this project. This entails building an embankment completely around the construction channel for half of the river width at a time. Both the building of the embankment and the channelization of the stream could cause increases in erosion and turbidity in the stream due to increased velocity. This would, in turn, cause some detrimental impacts on downstream aquatic life. The impacts of this construction technique can be reduced through:

- Use of sandbags or other noneroding material for embankment stabilization
- Agreement with the operators of Delaware and Alum Creek Lakes to keep the river near low flow
- Minimal dredging
- Rapid completion of the crossing
- Re-seeding and/or replanting of the vegetation of the stream bank, combined with temporary stabilization material.
- Resurfacing over the upper cement pipe casing with the original bottom sediments and restoring the original topographic contour of the river bottom.

These measures should all be used in conjunction in order to achieve optimization of cost and reduction of damages.

E. Treatment Process Alternatives

1. Treatment Approaches

Water reuse is presently an impractical alternative in southern Delaware County because of a lack of potential large-scale users. Home water reuse systems are not eligible for federal funding.

Land disposal as a possible treatment alternative is strongly limited by general poor soil suitability and shallow depth to bedrock. Transportation expenses to the nearest suitable site would be high, because it would require pumping and is about 18 miles away from the planning area. Many acres of land would need to purchased for the disposal site. A secondary wastewater treatment facility would be required for pre-treatment.

Treatment at the existing Jackson Pike facilites with discharge to the Scioto River will be used for the Scioto basin flows.

Treatment and discharge to the Olentangy River is the recommended alternative for the remainder of the service area. The biological treatment process proposed in the Facilities Plan, and outlined in Section D-1 of Chapter 3, would be utilized. Disinfection will be discussed in the next section. Additional treatment methods must be considered for the protection of stream life. The facility is designed for 1.5 MGD initially, with a planned expansion to 3.0 MGD. Peak flow capacities are 2.25 and 4.5 MGD for each phase, respectively.

2. Additional Treatment Alternatives at the Local Site

a. Aquatic Biota

The bottom dwelling (benthic) animal community in the Olentangy River downstream from the City of Delaware is not nearly as abundant and diverse as the grouping and number of clean water indicator species found further downstream at Powell Road (Olive, 1975). The numbers of mayflies, stoneflies, and caddisflies in this stretch of the river significantly increase upon reaching the Powell Road area of the river and further downstream, thus indicating the influence that the

Delaware sewage treatment plant has upon the benthic macroinvertebrates of the river. It is apparent that the increase of the clean-water indicators, the mayflies, stoneflies, and caddisflies, (which are also excellent fish food sources) in the area of Powell Road marks the area of the river where it significantly recovers from the effects of sewage effluent from Delaware City. Sewage treatment at Delaware has been upgraded since many of these data were collected, and additional improvements are planned.

The fish populations in the stretch of the river between Powell Road and the river crossing of Route 23 are similar to those found in the Powell Road area (Griswold, 1975). This abundant and diverse benthic population extends downstream past county line to the foot of the artificial riffle-pool area below I-270.

The largest populations of desirable game fish species are found at the artificial riffle-pool structures about two miles downstream from the plant site. These structures, built to supply the fish with habitats, are effective as indicated by the increased numbers of fish being caught by fisherman and by electroshocking collection data for this area. These channel modifications might also be responsible for the greatly decreased number of naiad mollusks found in this area. No specific data on this artificial fish habitat area have been collected, but the benthic community in this stretch of the river is even more abundant than that found and described at Powell Road by Olive (1975). Presumably, such bottom-dwelling animals as the larvae of mayflies, stoneflies and caddisflies must be present here in large numbers because they are essential as a food source for the fish reported to be here.

b. Impacts from Chlorine Discharges

The adjusted minimum release 7-day, once in 10-year low flow value (4.73 cfs at the proposed site) has been used for the calculations in determing the chlorine and ammonia concentrations in the river at the point of plant discharge. Because future drought conditions are possible in the area, and past release patterns in excess of 5 cfs from Delaware Lake may not be maintained. The use and consideration of these river conditions are necessary for an accurate assessment of the possible adverse impacts to the aquatic biota of the river from this plant.

The concentration of chlorine in the effluent of the proposed plant is expected to be 0.5 mg/l. At 1.5 MGD the concentration of residual chlorine during this low flow period in the immediate area downstream from the outfall would be approximately 0.17 mg/l. When the 1.5 MGD plant is expanded to 3 MGD at a future date, the chlorine residual concentration in the immediate area downstream from the outfall during low flow period would be approximately 0.25 mg/l. This is the concentration that has caused fish species diversity to go to zero (Tsai, 1971). At the average stream flow of 441 cfs, the chlorine residual concentration would be 0.003 mg/l instream, at the 1.5 MGD phase, and 0.006 mg/l at the 3.0 MGD phase.

Combinations of chlorine with ammonia and organic matter may occur to the detriment of aquatic life. Thus, toxicity to aquatic life does not solely depend upon the amount of chlorine added, but also upon the concentration of residual chlorine remaining and on the relative amounts of free chlorine and chloramines present. Chloramines are formed whenever water containing ammonia, ammonium hydroxide, or ammonium ions is chlorinated. The Fish and Wildlife Service has contested the plant's discharge limitations in a letter to Mr. Ned Williams, Director of the Ohio EPA (Appendix J). This letter recommends a concentration of residual chlorine in the receiving waters not exceeding 0.003 mg/l in order to protect aquatic life. This level as recently been confirmed for warm water fish (Brungs, 1976). Appendix H discusses the aquatic impacts in more detail.

c. Chlorination-Dechlorination and Ozonation

The most common disinfectants are the oxidizing chemicals such as bromine, iodine, chlorine, ozone, and other non-oxidizing chemicals such as acids and alkalies. Bromination, chlorination, and iodination of the sewage effluent leave bromine, chlorine, and iodine, respectively, in the effluent. Disinfection by additio of acids or alkalies is not effective unless the ph value of the water is less than 3 or greater than 11. Except for ozonation, all the disinfection treatment processes which involve the addition of chemicals, discussed above, leave significant amounts of dissolved solids in the effluent. These methods are further discussed in Appendix H. It is our conclusion that ozone would be the most cost-effective choice for this facility. The chlorination that is retained for influent septicity control will be satisfactorally removed by oxidation during the treatment process.

d. Impacts from Ammonia Discharges

In surface and ground waters, ammonia is usually formed by the decay of nitrogenous organic matter. Unpolluted rivers generally contain low ammonia concentrations, usually less than 0.2 mg/l as nitrogen. Ammonia is soluble in water and reacts with it to form ammonium hydroxide, which readily dissociates into ammonium and hydroxyl ions. This tends to increase the pH level. At higher pH levels, the ammonium ion readily changes to the unionized form, NH_3 , which is harmful to fish (Becker and Thacher, 1973).

The toxicity of ammonium salts and ammonia to aquatic life is thus related to the amount of ammonia, which is a function of the pH of the water. A relatively high concentration of ammonia in water at a low pH may not have toxic effects on fish life, but the percent of the unionized ammonia would increase as the pH is increased and also as temperatures increase. The toxicity of ammonia to fish life is also increased significantly with a decrease in dissolved oxygen levels. Upstream ammonia contributions will also vary the ammonia impact at a given discharge point. Appendix H discusses the impacts of ammonia in greater detail.

e. Nitrogen Removal

The chief nitrogeneous pollutants in municipal wastewaters have been categorized (Taras *et al.*, 1971) into three groups; ammonia nitrogen, organic nitrogen, and nitrite and nitrate nitrogen. Ammonia nitrogen in wastewater is formed by the enzymatic breakdown of urea, proteins, and other nitrogen-containing substances. Most of the organic nitrogen is wastewaters is in the form of amino acids, polypeptides, and proteins. Nitrite and nitrate are the end products of the oxidation of ammonia in the wastewaters.

In considering nitrogen removal measures, it is ammonia with which we are concerned, based on biological toxcicity. To avert excessive ammonia levels, the effluent must be nitrified. The proposed Olentangy Environmental Control Center has been designed for two stage suspended growth nitrification. Comparing the proposed facility to the operating El Lago, Texas plant, low levels of ammonia will be obtained, according to the EPA Municipal Environmental Research Laboratory evaluation. For comparable efficienty, the effluent ammonium (NH_4^+) nitrogen content would be 1.0 mg.l or less 95 percent of the time, and 0.35 mg/l or less 50 percent of the time. Similar effluent qualities have been observed at two stage nitrification plants in Marlborough, Massachusetts; Livermore, California and Manassas, Virginia.

Unionized ammonia (NH_3) may be less than these values, depending on the particular relationship of temperature and pH conditions. Given the relationships listed in Table H-5, of Appendix H, at 25°C and a pH of 8, the 1.0 mg/l of ammonium, NH_4^+, will indicate a total ammonia concentration of 1.06 mg/l, of which the additional 0.06 mg/l will be unionized ammonia, NH_3. Thus 95 percent of the time, the total ammonia concentration would be about two thirds of the permit limit of 1.5 mg/l. Operation conditions that would be expected 50 percent of the time yield 0.35 mg/l of ammonium and thus 0.37 mg/l of total ammonia and 0.02 mg/l of unionized ammonia, at a pH of 8 and 25°C. This is about one quarter of the permit level. Appendix H discusses ammonia dilution in the stream.

Ammonia removal methods, beyond the nitrification process planned for the proposed facility, are limited for practical purposes to breakpoint chlorination. Anaerobic denitrification discussed in the Draft EIS, removes another forms of nitrogen, nitrate nitrogen.

The breakpoint chlorination units would have to be followed by dechlorination and post aeration units. All of these have greater requirements than the units required only for chlorine disinfection of the effluent. Detailed controls would be required for operating this complex system. Since this system would be needed only for occasional use, operation of the system could be poor, due to operator unfamiliarity. This could result in more environmental damage than benefit. Inventories of toxic chlorine and sulfur dioxide would have to be maintained at the plant, as well. For these reasons, breakpoint chlorination is not recommended. Treatment efficiency at the proposed facility is estimated to be high enough to protect the stream.

Additional improvements proposed for the Delaware City treatment plant, upstream, will help to reduce the total level of ammonia in the Olentangy River.

f. Conclusions on Additional Treatment

In order to protect the high quality aquatic life of the Olentangy River, chlorine limitation in the effluent is necessary. Ozonation is the most effective way for achieving this, as it avoids the use of chlorine for disinfection. Ozone has no apparent toxic impacts to the aquatic life, it requires chemical production only on demand, and does not add dissolved solids to the stream. The chlorinated hydrocarbon levels from a chlorinated effluent would be very low because of post-aeration, stream dilution, and short contact time in the stream. The use of ozone would have the advantage of virtually eliminating these chlorine compounds in the effluent. (Section D-1 of Chapter 3 has described the occasional use of chlorine to control influent septicity). Ozone will provide positive disinfection for the treatment plant effluent and positive protection to the diverse ecology of the Olentangy River at a reasonable cost. Ozonation is therefore recommended for disinfection at this treatment facility.

The proposed two stage suspended growth nitrification system will be adequate to control ammonia at the proposed facility.

F. Sludge Treatment Alternatives

For all of the sludge alternatives discussed in Section E of Chapter 3, the truck transportation involved in sludge disposal could create a traffic nuisance and consume energy. The transportation units would have to secure, to prevent leaks, spills, or create odors.

Energy and chemical requirements differ for the alternatives. Aerobic digestion requires more electrical power than incineration or heat treatment. Fuel requirements are greatest for incineration and heat treatment. Chemical requirements are greatest for incineration, with dewatered aerobic sludge second, heat treatment third, and none required for liquid aerobic sludge.

Aerobic digestion is a less complicated process than incineration or heat treatment, providing for a greater ease of operation.

It is desirable that the process of treating sludge not produce undesirable odors or otherwise create a nuisance, be reliable, consume a minimum of energy resources, produce a satisfactory product, provide some degree of flexibility, and be economical. Cost-effective analysis of these five alternatives, A through E is presented in Appendix G. Plans A and C have similarly low present worth and average annual equivalent costs, with Plan B coming next. It is recommended that Plan C be implemented. Initially, the dewatered sludge can be transported to a landfill while sludge tests are being performed and suitable sites are investigated for either liquid or dewatered sludge application. Use of sludge for sodfarming may become a viable alternative. A combination of Plans A, B, and C can be utilized in the future, provided that Plan C is implemented initially and the sludge proves to be satisfactory for land application. The landfill will be present as a back-up measure, if land application is not feasible. Sludge resulting from the Scioto basin flows traveling to Columbus will be incinerated at the Jackson Pike Plant. The Columbus EIS awill address these particular sludge handling alternatives in detail.

G. Discharge Point Alternatives

1. Outfall Location

Although an extended outfall was suggested in the Draft EIS, an outfall at the plant site is preferred after further study. Extensive concern was raised in comments on the Draft EIS about the adverse impacts of the extended outfall. Because of rock, narrow rights-of-way, elevations, and other construction obstacles, the cost of this alternative has been extimated to be over 2½ times higher than the $1.2 million first proposed in the Draft EIS. Extensive park and recreational activity is found on the Olentangy, even downstream from the Scenic River segment, and additional parklands are proposed in this area. The City of Worthington has expressed concern over the desirability of the outfall location and its willingness to provide the final right-of-way for the outfall.

The alternative chosen is to discharge effluent adjacent to the treatment plant into the Olentangy River, just above the Delaware-Franklin County line, with effluent quality appropriate to protect stream life. A Settlement Agreement on this location was reached early in 1974 between the Delaware County Board of Commissioners and the Metropolitan Park District Board of Commissioners. Discharge

Scioto basin flows traveling to the Jackson Pike Plant will be discharged through the existing outfall into the Scioto River.

2. Outfall Design

Of the four outfall types discussed in Section F-2 of Chapter 3, types III and IV provide a quick mixing of the effluent and river water, but produce a zone of concentrated effluent across the river which caused heavy fish depletion and a barrier that adversely affected fish movement and migration. In contrast, the effluent leaving a Type I outfall traveled a greater length of the river and required a longer time before it became completely mixed with the water across the stream. Thus, the effluent underwent a better dilution and natural purification. The mixing zone in this type of design contained less concentrated sewage effluent when compared to the other three types of outfalls. From the standpoint of fish and aquatic life protection, the primitive Type I outfall is a better design than the other more complicated types (Tsai, 1971). It is recommended for the Delaware County treatment plant. The outfall will be submerged, in order to prevent excess foaming.

H. Summary of the Proposed Action

1. Treatment Plant

The treatment facility will be located above the Delaware-Franklin County Line, between the Olentangy River and state route 315 (site OR-3), as proposed in the Facilities Plan. It will initially be a 1.5 MGD plant, expanding by the end of the 20-year planning period to 3.0 MGD. Peak flows for each phase will be 2.25 MGD and 4.5 MGD, respectively. The Scioto basin flow, from Muirfield Village and Shawnee Hills, will be treated at the existing Jackson Pike plant in Columbus.

2. Interceptors

A new system of interceptors will be built to serve the Olentangy Environmental Control Center, in three phases. Phase I will serve the Alum Creek Lake and Westerville Reservoir areas, Powell Road east of S.R. 315, and a residential area north of Powell Road west of S.R. 315. Phase II extends to serve additional areas south of Alum Creek Lake. Sewers will extend up to Powell and Home Road in the Olentangy basin, branching to serve the Carriage Road area and more of Powell. Phase III extends around Alum Creek Lake and adjacent areas, and in the Olentangy basin up to Delaware Township. Muirfield Village and Shawnee Hills, in the western half of the Scioto basin, will be served via Dublin. The remainder of the Delaware County planning area within the Scioto basin will be served by Delaware County or by Columbus, pending the results of a cost-effective analysis at the time that sewer service is desired for this area.

3. Treatment Processes

Tertiary sewage treatment will consist of a 2-stage biological activated sludge process, including phosphorus reduction followed by rapid sand filtration. Disinfection will be accomplished by ozonation. A high quality effluent will result. The discharge per permit for the facility is shown in Appendix A.

4. Sludge

The sludge generated by the treatment process will be aerobically digested and trucked to a state-approved sanitary landfill site. Use of sludge for sodfarming may be a viable future alternative.

5. Discharge Point

Discharge will be adjacent to the treatment facility, just above the Delaware-Franklin County line.

CHAPTER 5
ENVIRONMENTAL EFFECTS OF PROPOSED ACTION

A. Water Quality and Quantity

1. Flows

A schematic presentation of the adjusted minimum release 7-day, once in 10-year low flow along the Olentangy River is given in Figure 5-1. When the Olentangy Environmental Control Center is constructed, it will be sized to discharge 1.5 MGD (2.33 cfs) of effluent into the Olentangy River just above the the Delaware-Franklin County line and be expanded to 3 MGD (4.65 cfs) by the end of the 20-year planning period. To arrive at the flow value used in Figure 5-1, it has been assumed that Del-Co Water Company would not withdraw water from the Olentangy River during 7-day, once in 10-year low flow periods. This assumption is justified by the fact, that, during low flow periods, the intake would be so close to the river bed so that, for drinking purposes, extensive purification work would be required to remove the silt content and turbidity from the raw water. The Del-Co Water Company has a storage reservoir with a capacity to meet 60-day water demand by its customers, and the Company plans to expand the reservoir to a 90-day capacity (Gilbert, 1975). One of the objectives of expanding the storage reservoir is to reserve water for dry weather periods during which withdrawal and purification of water from the Olentangy River would be difficult. This will also prevent the aggravation of low flow stream conditions.

Muirfield Village uses water from the City of Columbus. The Del-Co Water Company and the City of Delaware are the sole

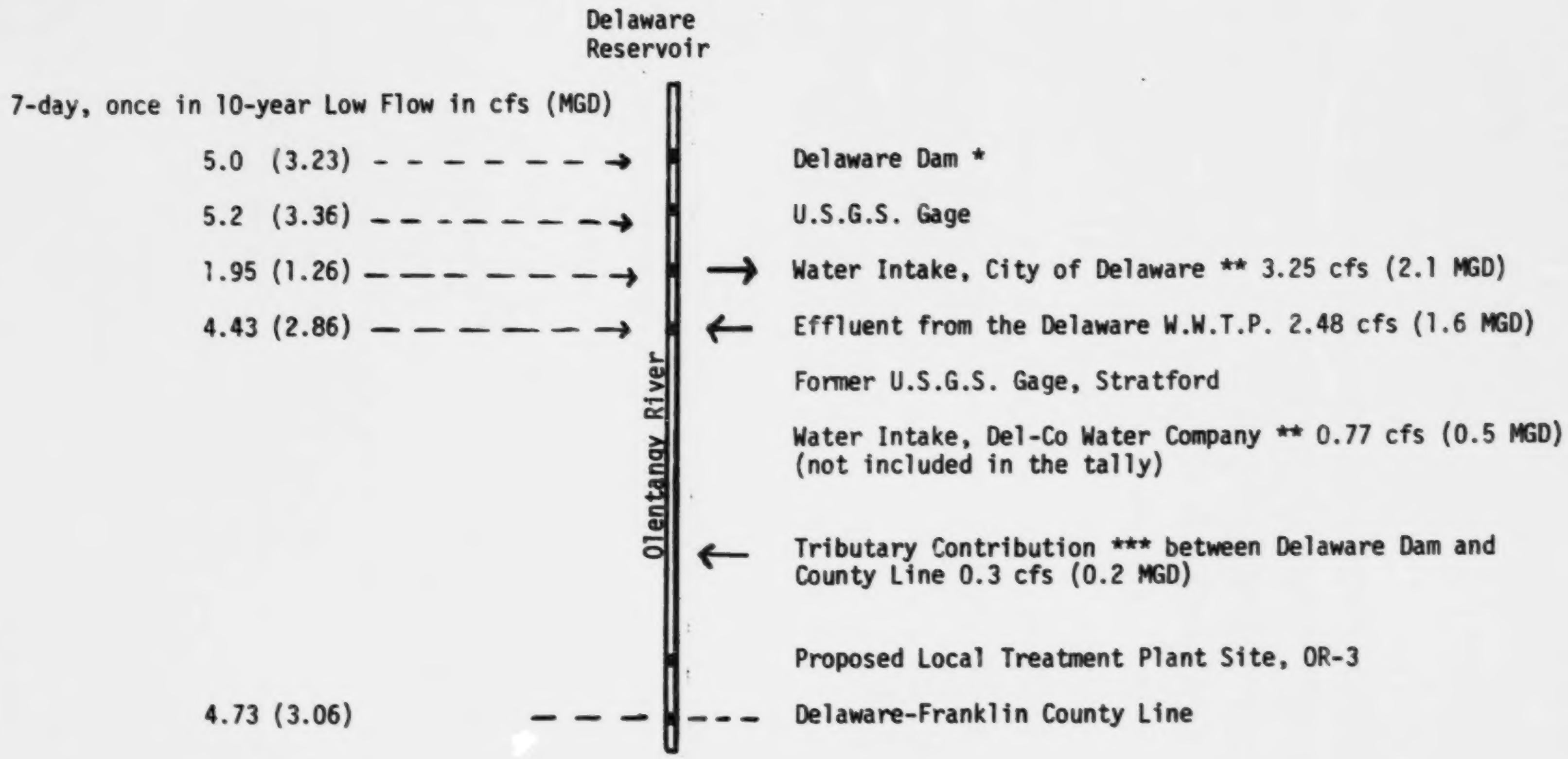

Delaware Reservoir
7-day, once in 10-year Low Flow in cfs (MGD)
5.0 (3.23)
5.2 (3.36)
1.95 (1.26)
4.43 (2.86)
4.73 (3.06)
Olentangy River
Delaware Dam *
U.S.G.S. Gage
Water Intake, City of Delaware ** 3.25 cfs (2.1 MGD)
Effluent from the Delaware W.W.T.P. 2.48 cfs (1.6 MGD)
Former U.S.G.S. Gage, Stratford
Water Intake, Del-Co Water Company ** 0.77 cfs (0.5 MGD) (not included in the tally)
Tributary Contribution *** between Delaware Dam and County Line 0.3 cfs (0.2 MGD)
Proposed Local Treatment Plant Site, OR-3
Delaware-Franklin County Line

Figure 5-1. The Adjusted Minimum Release 7-day, once in 10-year Low Flow in the Olentangy River

Sources: * U.S.Army Corps of Engineers, 1975 (Appendix J); ** Gilbert, 1975; *** U.S.G.S., 1976 (Appendix J) sources of surface water supply systems serving the remaining planning area. The water withdrawn by the Del-Co Water Company would be returned to the Olentangy River in the form of sewage effluent, shortly downstream of where it is withdrawn, except for the losses due to consumption, exfiltration, evapo-transpiration, and the part of the surface water which would be regionalized in the Scioto basin. This is a long-term, beneficial impact, of Class II irreversibility. Whatever transfer of Del-Co water from the Olentangy basin to the Scioto basin, occurs through regional treatment would be a long term, adverse impact, of Class II irreversibility. However, the magnitude of this will be extremely small unless the remainder of the Scioto basin in the Delaware County planning area were to be served by Columbus. Also, the Olentangy River joins the Scioto, so flows would remain within the greater drainage basin.

The irreversibility of environmental impacts is divided into two groups for this report. Class I impacts are those which are absolutely irreversible, such as labor and fuel. Class II impacts are for all practical purposes irreversible, unless very extensive and costly efforts are made to alter them. Examples of these impacts would be major treatment plant structures, and large scale biological changes.

Streamflow in the Scioto River and Alum Creek will be virtually unaffected by this project. Phasing out septic systems will alter the water regieme slightly, by returning water to the Olentangy rather than to the soil. This will slightly tend to reduce groundwater recharge, which would be a long-term, adverse impact of Class II irreversibility. However, an increasing proportion of this water will be supplied by the Olentangy, rather than from groundwater as discussed in Chapter 2. This factor greatly reduces the significance of this particular impact.

2. Waste Loads

The waste loads and their geographical distributions were investigated and compiled in the Scioto River Basin Waste Load Allocation Report (Ohio EPA, 1974). This report was the result of a basin plan study specifically required by Section 303(e) of the Federal Water Pollution Control Act of 1972. Table 5-1 tabulates the existing loads of BOD , total dissolved solids (TDS), ammonia (NH_3), and fecal coliforms in the Olentangy River reach between the Delaware Dam and the river mouth, at the confluence of the Olentangy River and the Scioto River in Franklin County. Their allowable loads (Ohio EPA, 1974) are also indicated in Table 5-2. The allowable loads were derived from the assumed low river flow of 9.7 MGD (15 cfs) and the water quality standards for the Olentangy River in the Scioto River Basin Waste Load Allocation Report. This low flow differs from the adjusted minimum release 7-day, once in 10-year low flow of 4.7 cfs at the site, which is less than one-third of the amount used for calculation in the waste load allocation program. The safety factor assigned in the waste load allocation program is approximately 2.0 or slightly larger, which will not be able to provide the marginal safety if the adjusted minimum release 7-day, once in 10-year low flow does occur. Even the historical modified 7-day, once in 10-year low flow is 9.7 cfs at the county line, or about two-thirds of the flow used for modeling.

Table 5-1. Waste Loads of the Olentangy River Reach Between the Delaware Dam and the River's Mouth

Variables	BOD_5 in lb/day	TDS in lb/day	NH_3 as N in lb/day	Fecal Coliform in 10^{10}/day
Load entering from upstream	178.2	22,194	14.8	19.48
Load Added this Reach	59.4	4,293	113.5	tntc*
Allowable Load	768.1	20,250	117.1	7.35

*too numerous to count

Source: Ohio EPA, 1974

Table 5-2. Comparison Between the Waste Load of the Proposed OECC Plant and the Allowable Load of the Olentangy River

Parameters	Effluent Concentration Monthly Average in mg/l(MPN/100 ml)	Waste Load from the Proposed Plant in lb/day (10^{10}/day) (at 3 MGD)	Allowable Load of the Olentangy River with Built-In Safety Factor in lb/day (10^{10}/day)
BOD_5	8.0	200.4	768.1
TSS	8.0	200.4	---
TDS	596	14,930	20,250
NH_3as N	0.5	12.55	117.1
Fecal Coliforms	(200)	(2.27)	(7.35)
Phosphorus	3.0	75.15	---
Oil & Greases	10	250.5	---
Chloride	90	225.45	10,125

Source: Ohio EPA, 1974

The pollutant loads from the proposed plant based on its projected 20-year capacity of 3 MGD and its designated effluent quality standards are presented in Table 5-2. All parameters appear acceptable. This is a long term, beneficial effect which would be reversible, if treatment levels were decreased.

3. Water Quality

Based on the initial design capacity (1.5 MGD) of the proposed plant, a computer simulation was conducted using the Ohio EPA computer model of the water quality conditions (Burgess & Niple, Ltd, 1974) for the river segment between the proposed plant site with discharge just above the Delaware-Franklin County Line and the U.S.G.S. gage station approximately 2.6 miles downstream from the site. The river dilution flow was assumed to be 8.6 MGD (13.3 cfs), the water temperature 25° C, and the flow velocity 0.33 feet per second. This 8.6 MGD flow is slightly less than the 9.7 MGD flow used by Ohio EPA to calculate the wasteload allocation. However, it is higher than both the historical modified 7-day, once in 10-year low flow of 6.27 MGD and the adjusted minimum release 7-day, once in 10-year low flow of 3.05 MGD. The dissolved oxygen (D.O.) concentration and BOD_5, NH_3, and organic nitrogen loads were calculated by the computer program. This program is based on the Streeter-Phelps equations for mixing two pollutant streams. The computer results are given in Appendix F.

In Appendix F two D.O. sags are noticed at the mixing points of the proposed Delaware County plant and the Worthington Hills STP. However, all the D.O. values are well above the 6.0 mg/l standard promulgated by the Ohio EPA for this river system.

An increase of 0.02 mg/l of ammonia concentration from the upstream concentration of 0.5 mg/l is calculated at the mixing point of the plant. This increase is attributable to the effluent of the plant. The ammonia concentration remains approximately constant with flow downstream and experiences a rise of 0.31 mg/l at the mixing point of the Worthington Hills STP. The stream water quality standard for NH_3 in this river segment is 1.5 mg/l, therefore, no violation of ammonia concentration is anticipated from the proposed action. This would be true at the point where an extended outfall would discharge as well. As discussed in Chapter 4, this level of NH_3 is sufficient to protect aquatic life in this river segment.

The flowing load of BOD_5 at the proposed site would be 270 pounds per day (Appendix F) which would be less than the allowable BOD_5 load (Table 5-2)established in the Waste Load Allocation Report. The waste load of ammonia at the proposed site would be 36 pounds per day of nitrogen compared to the allowable load of 117.1 pounds per day (Appendix F). Therefore, no violation would be observed. The organic nitrogen load at the proposed site would be 89.0 pounds per day. No allowable load for organanic nitrogen has yet been promulgated. It should be noted that this computer simulation is based on a low flow of 8.6 MGD (13.3 cfs) which is higher than the low flows developed for this site in Chapter 2. To quantify the effects when the historical modified or the adjusted minimum release 7-day, once in 10-year low flows do occur, additional computer simulation would have to be conducted, both for developing a new waste load allocation and for modeling the instream water quality conditions.

No apparent violations of the present water quality standards and allowable waste load allocations would be caused by the proposed treatment facility. It is anticipated that some violations would occur if the historical modified or the adjusted minimum release 7-day, once in 10 year low flow is reached, because the present waste load allocations are based on a higher low flow value than these values. The long-term effect to water quality would be beneficial, until flow becomes very low, below the value used to calculate the present waste load allocation, when the effect becomes detrimental. Inadequate treatment could make these effects uniformly detrimental. However, the facility is designed to provide a very high degree of treatment.

Phasing out the overloaded Worthington Hills package plant in 1977 will aid in improving water quality in the Olentangy. This action is not included in the scope of the proposed project, however. The Olentangy Interceptor to Columbus terminates by the Worthington Hills facility, but the plant's flow has not yet been incorporated into the Columbus system.

The proposed improvements and an upgraded permit for the Delaware City treatment facility will likewise benefit the Olentangy River. These improvements are also beyond the scope of this EIS. Water quality in the Scioto River and in Alum Creek will also be improved, due to the gradual phasing out of malfunctioning septic tanks in the service area, and a reduction in the percentage of new septic tanks installed. This is a long term, beneficial effect, which would be reversible if use of the central sewerage system were decreased.

4. Impacts

The water temperature, pH value, concentrations of dissolved oxygen, nitrate, total dissolved solids (TDS), chloride, dissolved iron, chromium, zinc and copper are well within the present water quality standards. Considering that the effluent from the proposed plant would have at least 6 mg/l of DO, maximum BOD_5 of 8 mg/l, and the present allowable waste loads for BOD and none of these should present significant problems. These impacts are benficial and long term, but could be threatened by less adequate treatment. Extreme low flow would create adverse impacts, due to the comparatively high figure used for the low flow value in the waste load allocations.

Ammonia standards are reported to have been violated approximately 10 per cent of the time in the past samples. (Ohio EPA, 1974). Under the assumption that the waste load allocation program (Ohio EPA, 1974) would be successfully implemented, the instream ammonia concentrations would be so reduced that the ammonia concentration at the mixing point of the proposed plant site would be within the 1.5 mg/l limit at all times. This is a long term benefit which used for calculating the present waste load allocation.

The fecal coliform concentration of the river water has been reported many times as "too numerous to count" (Ohio EPA, 1974). The same situation has occurred throughout the entire river segment, indicating that it is highly polluted by municipal sewage. (Municipal sources are specified because among the total source loads of BOD_5, TSS, phosphorus, NH_3, and total Kjeldahl nitrogen. The municipal sources account for more than 95 per cent and their discharges correlate well with the fecal coliform loads). These municipal sources include the Delaware Sewage Treatment Plant and small package treatment plants of various commercial facilities and educational institutions (Ohio EPA, 1974). Septic tank runoff also contributes to increased colifrom levels in the area is streams. The effluent limitation on fecal coliforms is 200 per 100 ml, thereby assuring that the fecal coliform load from the proposed plant is kept within the allowable load standards of the stream. To achieve this goal, the plant will be designed with an ozone system for disinfection. The public health aspects are long term and benficial, if not reversed by inadequate treatment. The biological implications of this are discussed in Appendix H.

Discontinuing the use of septic tanks and package plants will help to improve water quality. Improved operation of existing sewage treatment facilities must also be persued to effect stream clean-up. The Worthington Hills treatment plant is to be phased out in 1977. The City of Delaware is proposing treatment improvements in its Plan of Study. A cleaner water supply for Delaware County and Columbus will result from this project, which is a long term, beneficial, reversible impact. The water supply reservoirs will be protected and the Del-Co water company's Olentangy intake will withdraw cleaner water.

No effluent quality standards have been established for other constituents such as iron, cadmium, chromium, zinc, and copper. Any industrial wastewaters which contain high concentrations of these constituents would be adequately pretreated in accordance with EPA regulations before discharge into the sewage collection system.

Wells located downstream from the proposed sewage treatment facilities along the Olentangy River at Worthington Hills will not be adversely impacted by the treated effluent. Septicity from BOD levels will not harm wells. Nutrients are not considered a defined pollutant with respect to drinking water, so no impact is anticipated. Nitrate levels in the treated effluent will be 1.0 mg/l as nitrogen, or less. Drinking water standards are 10.0 mg/l as nitrogen. Disinfection of the effluent will assure very low coliform bacteria levels. In addition, penetration of water through soil or sand to the water table filters out bacteria.

Some adverse impacts on water quality can result from the project construction. Erosion and siltation problems associated with sewer construction, dissolved oxygen depletion, BOD, and turbidity associated with the dredging activities for sewer river crossings and outfall work are the major concerns.

Erosion due to plant construction could have some effects on water quality such as increase of turbidity, total suspended solids, and total settleable solids. Upon discharging these materials into the river, siltation might result in the downstream segment where flow velocity decreases below that required to maintain the load in suspension and it drops out, modifying the channel form. Turbidity of the water will occur, even with low levles of sediment being added to the water. These impacts will be largely mitigated by sediment basins and other erosion control techniques at the construction site.

Dredging activities required by the construction of sewer river crossings and effluent outfall structures may cause some water quality problems. Turbidity will increase, particularly if there is much silt and clay in the riverbed. Dissolved oxygen depression would be a consequence of the high chemical oxygen demand by the re-entrainment of river bed sediments, particularly if this occurs during warm weather. Levels of total sufides, usually considered toxic substances and chemical compounds of high oxygen demand, would increase near a dredging site (Jeane & Pine, 1975). Although the river bed of the Olentangy River is essentially of calcareous nature, the low stream velocity at low flow cannot preclude the existence of some organic sediments. The dissolved oxygen depletion may occur during dredging periods, but will not be so significant as reported elsewhere where it dropped below 4.0 mg/l (Jeane & Pine, 1975), because of less organic content of the bottom sediments of the Olentangy River. The degree of depletion of dissolved oxygen due to river dredging cannot be quantified without knowing the oxygen demand of the river sediment. Some fo these impacts are short term, as turbidity while others are long term, as sedimentation. These will be largely mitigated by control measures, but the remaining impacts are adverse, and are essentially irreversible (Class II).

B. Air

1. Air Quality

The anticipated emissions of total suspended particulates and sulfur dioxide from the proposed treatment plant are of a minor nature, similar to that of space heating for a small industrial facility. No incineration of sludge is proposed for Delaware County.

Residential development is anticipated to increase with the advent of central sewage treatment facilities in Southern Delaware County. This, along with associated commercial and industrial activity, will have some adverse impact on future ambient air quality. This a long term adverse impact of irreversibility Class II. This change must be taken into account for any new point source requiring an air quality permit.

Any carbon monoxide mantenance problems developing along transportation corridors will be addressed in highway Environmental Impact Statements.

2. Air-Borne Pathogens

Research has demonstrated that microorganisms are emitted to the atmosphere by aerosols generated from sewage treatment processes (Fair and Wells, 1934), (Randall and Ledbetter, 1966), (Adams and Spendlove, 1970), (Pereira and Benjaminson, 1975). Extensive literature reviews by USEPA (1975-d) and Hickey and Reist (1975) have been inconclusive about the existence of a health risk, at the present level of scientific knowledge. It is, therefore, the conclusion of USEPA that no demonstrable health hazard has been shown to exist with respect to the operation of activated sludge facilities, such as those proposed by Delaware County.

As the aerosols leave the sewage treatment plant the local microclimate affects their dispersion patterns and microbial survival rates. The bacteria and viruses will remain viable and travel farther, in general, with increased wind velocity, increased relative humidity, lower temperatures, and darkness. Resistance to environmental stress and increased viability also is highly dependent upon the particular species and its life cycle stage.

Studies have indicated rapid aerosol bacterial die-off with increased distance from the source (Ledbetter and Randall, 1965). For example, downwind from a trickling filter treatment plant coliform bacteria were found to be on one occasion:

100 yards	$159/m^3$
300 yards	$70/m^3$
600 yards	$7/m^3$
0.8 mile	$3/m^3$

At another plant, these results were obtained:

130 feet	$490/m^3$
300 yards	$183/m^3$
0.5 mile	$109/m^3$

(Adams and Spendlove, 1970)

Although we know that respiratory and intestinal pathogens may be present in aerosols downwind from sewage treatment facilities, we have no sound basis for making conclusive judgments as to the public health significance of this fact. The infection mechanism, once bacteria are inhaled or ingested, is not well enough documented to determine the threshold dose of the organism necessary for infection traceable to treatment works.

The significance of air-borne pathogens from sewage treatment facilities to the human population is presently the subject of an epidemiological research study by EPA, scheduled for completion by January, 1977. The John Egan Water Reclamation Plant of the Metropolitan Santiary District of Greater Chicago at Schaumburg, Illinois, has been the subject of this two year study, calculated to compare the health of 1000 randomly selected surrounding households before and after the treatment facility was put in operation. Periodic clinical examiniations of volunteer residents and health experience surveys are being employed for this purpose. Ambient air, water, sewage, and soils will also be sampled for the presence and quantity of infectious bacteria, viruses, and parasites.

The aeration tanks of the proposed Olentangy Environmental Control Center, when measured from aerial photographs, are about 1900 feet (0.36 mile) WNW from the bluff overlook point of Highbanks Park (Figure 5-2), about 3600 feet (0.68 mile) SSW from the central picnic area of the Park, and 4800 feet (0.91 mile) SSE from the northern picnic area of the Park. Prevailing winds are from the south and south-southwest, as illustrated in the wind rose of Figure 5-3. Thus, winds crossing the treatment facility will also cross portions of Highbanks Park under prevalent conditions. However, the distances present assure considerably reduced levels of microorganisms in the aerosols generated in the sewage treatment process. As previously discussed, the actual viability is influenced by a number of environmental variables, in addition to distance.

While there has been no demonstrated evidence of any public health hazard from microbe transmission in sewage treatment aerosols, the intent, purpose, and spirit of the National

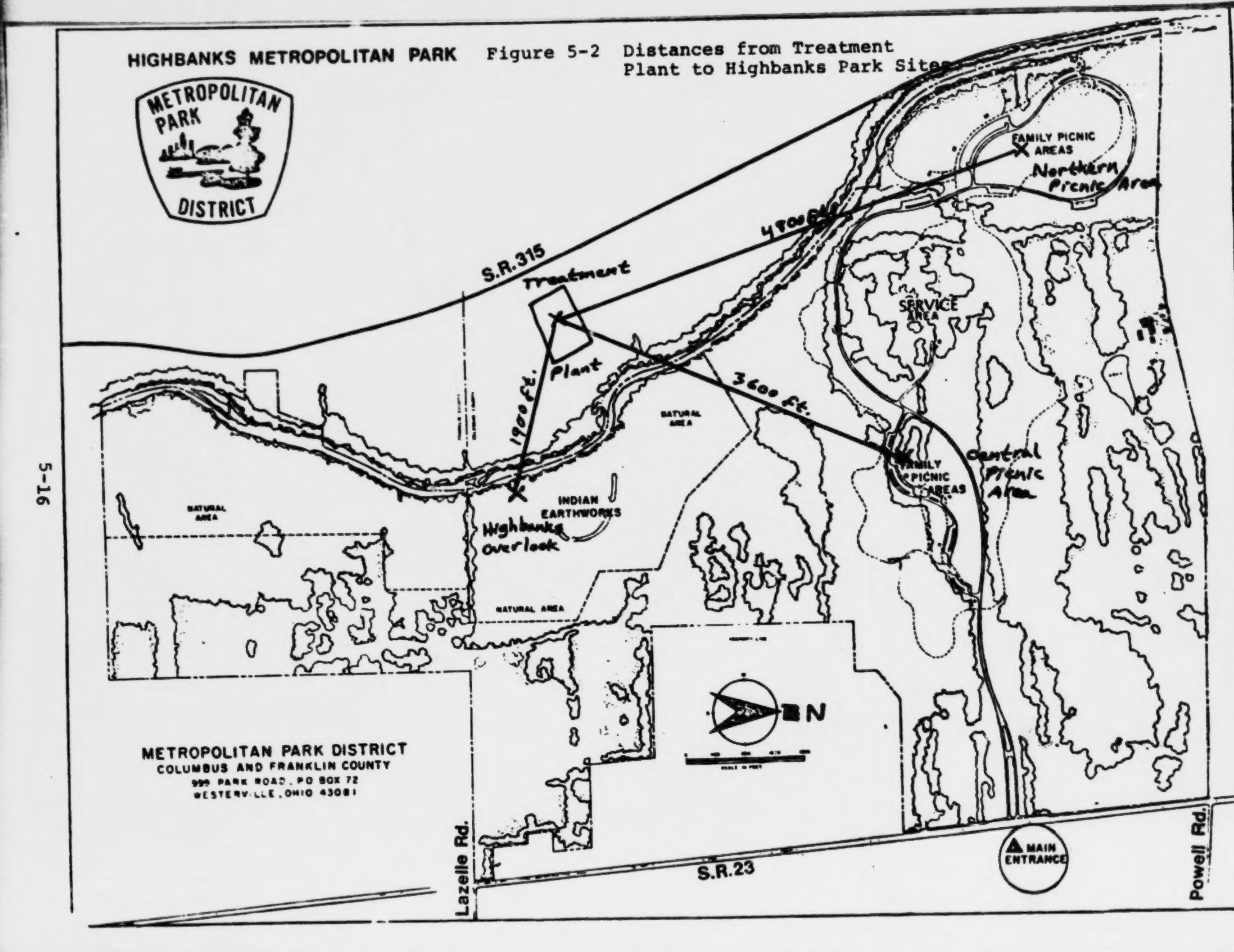
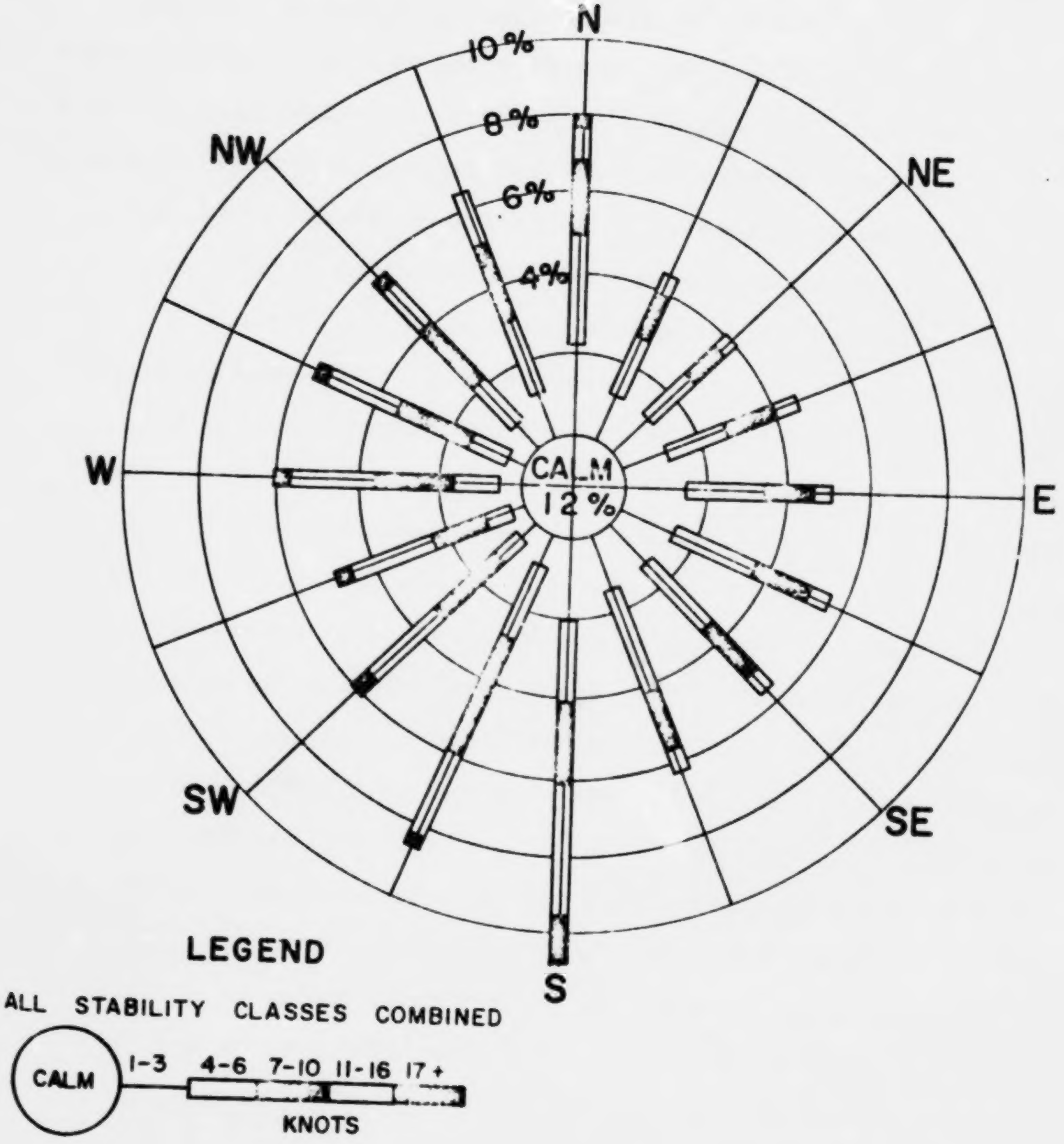


Figure 5-2 Distances from Treatment Plant to Highbanks Park Sites

Figure 5-3



ANNUAL WIND ROSE

Source: Malcolm Pirnie, Inc., 1975.

Environmental Policy Act (NEPA) indicate that adverse impacts should be mitigated if reasonably discernable. Presently the adverse impacts are not so discernable, in light of both the current state of scientific knowledge and the distances generally prevelant from the areas of intensive use in Highbanks Park. If future evidence, such as that derived from epidemiological studies, indicates that the proposed Delaware County sewage treatment facilities present a demonstrated public health hazard, mitigation would be in order and required to be implemented.

If total suppression of aerosols were then deemed necessary the aeration tanks could be covered and the air treated to remove the aerosol droplets prior to discharge outside of the enclosure. A preliminary capital cost approximation for this was provided by EPA's Municipal Environmental Research Laboratory in Cincinnati. Actual costs would reflect such variables as foam, humidity, condensation traps, accessibility to diffuser equipment, filter housing, and aesthetic mitigation. This preliminary analysis determined that the aeration basins would be provided with six-inch thick concrete covers and that each basin would be equipped with a separate set of dual filters for air treatment prior to discharge to the atmosphere. The first roughing filter would be constructed similar to a mist eliminator, and the polishing filter would be made of a fiberglass matting material. The estimates are as follows:

Tank cover costs	$49,400
Filter costs	1,000
Ductwork costs	9,000
Subtotal	$59,400
Total Capital costs (120% of subtotal)	$71,000

The filters would have to be periodically changed as a part of the maintenance program. Air would pass through the filters from the aeration pressure. The covering would be designed not to retard the aeration process.

In addition to the epidemiological study discussed above, EPA is funding a study comparing the health of sewer maintenance workers and highway workers in Cincinnati, Ohio. These studies and other research programs which will be pursued will help in evaluating the public health aspects related to sewage treatment facilities. If a health hazard from aerosols is, in fact, demonstrated, aerosol suppression methods will be studied and installed.

C. Land Use

1. Primary Land Use Impacts

Immediate land use changes occuring from the proposed action will be at the treatment plant site and along interceptor routes. The Olentangy Environmental Control Center will be located in what is presently farmland. Interceptors will follow existing rights-of-way when possible, about half of the time. Most interceptors will follow road alignments or stream drainage patterns.

Surrounding land uses -- farmland, parkland, and residential areas -- will be impacted by the treatment facility, although these impacts have been greatly reduced through various mitigative measures. After construction is completed, architectural treatment and landscaping will contribute to the attractiveness of the treatment plant site, and largely screen it from surrounding areas. The extensive odor and noise controls will be discussed in Section F of this chapter. The treatment plant is a long-term, adverse structure serving a beneficial purpose. It is in irreversibility Class II.

Revegetation of the interceptor routes will help to blend them into their surroundings. No exposed pipes will be present in the interceptor system, except those crossing beneath bridges. Stream crossings of interceptors will be buried.

Interceptors are long term, beneficial structures of irreversibility Class II. Their construction causes short term adverse impacts which may be mitigated to a large extent. Building materials, labor and energy for both the plant and the sewers are irreversible Class I, long term commitments with short term beneficial aspects to the economy from their construction.

Energy will be consumed in project construction. This is a short term, irreversible (Class I) adverse impact. Energy will also be required for treatment plant operation and force main pumping. This is a long term, adverse impact which is in irreversibility Class I.

Sludge disposal will occur at an approved sanitary landfill site. This should minimize the hazard of ground water contamination from landfill leachate. If land application of sludge is later utilized, such as for sod production, properly chosen sites and correct seasonal application will minimize water pollution. The use of trucks for sludge transport to the landfill site may create a slight adverse traffic nuisance in some areas, with Class II reversibility. Route planning and timing will serve to minimize this problem. Landfilling sludge is a long term, adverse impact of Class II irreversibility. It is less beneficial than returning the sludge nutrients to the land.

2. Secondary Impacts on Land Use and Growth

Secondary impacts of the treatment plant and interceptors may include those associated with industrial and residential development, changes in land values, shifts in the centers of retail trade concentration, shifts in the location of the most attractive recreational sites, and changes in the pattern of recreational activities. Secondary impacts on growth which derive from the proposed action are determined by a comparison of the amount and types of development which would occur without the project, the "no-action" alternative.

One secondary growth impact resulting from implementation of the proposed action would be an increased rate of growth in population and in economic activity in the project area. However, if no public sewering were to be provided throughout the project area, there would still be some growth, because the project area is highly attractive to residential and light industrial development and on-lot systems could be designed to accommodate new growth. Population growth is a long term impact, reversible, beneficial to the local economy, but adverse to the existing environment. The absence of public sewering will not preclude development, unless a building ban is reissued for the area but will instead alter development patterns and rates as determined by the present county septic tank and package plant controls. Section C-3 of Chapter 4 has shown that initial costs to the homeowner will be roughly comparable either for on-lot or the central treatment system.

Because of poor local conditions for septic systems, a building ban was previously in effect before the development of plans for a central sewage system.

Patterns of growth will be influenced by the interceptor and collector sewer configuration, because it is less costly to connect collecting sewers close to the main sewer lines. This will be particularly true when the sewers follow roads. Part of the relative increases in rates of population growth that could be caused by the proposed action relate to the construction of additional higher density housing, such as apartments and trailer courts, and planned unit developments (PUD), if permitted by local zoning.

The increased growth of population potentially attracted by public sewering would cause a number of related impacts. These impacts would be moderate compared to the growth occuring without the proposed action, as some growth would occur under those circumstances. However these impacts could have a large absolute impact on the environment, when compared to the existing environment without the proposed action and the existing population. The impacts are:

- Increased erosion
- Increased stormwater runoff
- More polluted stormwater runoff
- Reduction of prime agricultural land and wildlife habitat
- Development pressure on remaining farmland
- Increased siltation in local stream
- Air pollution increases

- Increased burdens on school systems road and other public services.
- Increased solids waste volumes.

Increased erosion would result from construction of new homes and other buildings on the easily erodable soils that exist in most parts of the project area. Increased siltation in local streams would result from increased soil erosion on the slopes. This siltation could combine with increases in stormwater runoff to produce increased flood levels during rain storms. Increased stormwater runoff would result from increases in impermeable areas resulting from increased development. Erosion control requirements in the area, if initiated, would aid in greatly reducing these impacts. More polluted stormwater would primarily result from rain flushing oils and other petro-chemicals from paved areas. Estimating the quantitative measure of stream pollution resulting from urbanization is very difficult. Stormwater retention basins and a stormwater pollution abatement program could minimize these adverse effects. Soil loss is an adverse long term impact of ineversibility Class II.

New housing will remove land from agricultural and wildlife uses. Zoning could aid in retaining these land uses. The remaining farmland may undergo intense pressure for development via taxes or other mechanisms. Taxation and zoning methods could seek to retain prime agricultural land in active farming uses. These mitigative measures would have to be initiated at the state or local levels. Farm land and habitat loss are long term adverse impacts of irreversibility Class II.

In general, increased growth would increase the local costs of providing various community services, such as schools, and roads, but presumably would be accompanied by an expanded tax base. It is quite possible that revenues gained from this increased growth would not completely cover the extra expenditures necessary to provide the services to support the growth or that there would be a lag time between the need for the services and the ability to initiate and/or fully finance the services. Local planning efforts here are essential to minimize or reduce this problem. These would be adverse impacts of short to long term duration which are reversible.

Present solid waste service in southern Delaware County is provided by private haulers, with disposal at the approved Butterfield sanitary landfill which is also privately owned. It has an anticipated service life of ten years, based on serving a population of 15,000. Assuming a per-capita quantity of 3 pounds per day, an average rate of 7,500 tons of refuse through 1990 will be produced in this part of the county (assuming a 1990 population of 30,000). Several sites in the county are suitable for future landfill development. One in particular is a clay pit in the vicinity of Sunburg and Galena. The 100 acres available for landfill development would have an estimated service life of 40 years for all of Delaware County.

An energy/resource recovery facility would be an alternate to landfilling solid waste. Metals and glass would be recycled, compostable substances could be used for agriculture, and other burnable substances could serve to generate electricity, such as as at a system proposed for Columbus.

A number of other impacts which might result from the implementation of the proposed action are directly related to the types of growth and development that are facilitated by public sewering. These impacts are:

- Leapfrog development, whereby suitable areas in northern Franklin County might be bypassed
- Increased speculation
- Changed spatial locations of new subdivisions with respect to streams
- Lower total cost of sewage treatment over the long term.

Public sewering may possibly cause development to leapfrog past areas in Franklin County which have not yet developed to an extent commensurate with efficient utilization of their sewers and roads. The advent of public sewering, would increase development in the project area somewhat more than the "no action" alternative. Hence, the amounts of excess development will be proportionate and only slightly leapfrog beyond that which is now taking place and likely to continue. Extensive and rapid development is occuring in northern Franklin County at the present time. Speculation, which is already generally high in areas expected to receive public sewering, is not expected to be greatly increased. These are adverse, short term impacts which may be reversed.

The Delaware County septic tank ordinance would encourage choppy development patterns of homes on large lots. Subdivisions of greater than four units require waste treatment through means other than septic fields; package plants must discharge into continuously flowing streams. Hence, without central sewage treatment, development of the larger subdivisions with package plants would be largely restricted to the proximity of perennial streams. With the proposed project, development of subdivisions could occur in a greater variety of locations and would tend to cluster near the interceptors for economical sewer layouts. Real estate development would not be attracted to perennial streams for sewage treatment reasons, except where the interceptors and streams parallel each other or for aesthetic reasons. These are long term, Class II irreversible impacts which are generally beneficial. Stream corridors are ideal areas for recreation and preservation of open space and high quality natural environments. This could be accomplished if appropriate land use controls or incentives were adopted locally.

The costs of first building a septic field or package system and then, at some time in the future, replacing it with a public sewer connection are duplications of expensive items as has been shown in Chapter 4, and therefore costly in terms of both public and private capital. Tapping into the new system will be mandatory only for homes constructed in 1969 or later, or for homes designated to tie in by the County Commissioners.

3. Planning Needs

Current growth pressure in the project area will necessitate vigorous local and regional planning. These growth pressures both complicate and magnify the importance of the planning process. Population will grow significantly, employment structures will change, and already high accessibility will increase in all portions of the project area. Growth is anticipated under any of the alternatives for sewage treatment, but is expected to occur more rapidly with a central sewage system. Development pressures, unless properly guided, will degrade valuable local recreational, scenic, and natural resources and burden municipal services. Many mitigative measures can be locally initiated to reduce the primary adverse effects of this particular project, as discussed in the preceeding paragraphs. However, planning to mitigate secondary impacts will necessitate implementation of an overall planning program that is well coordinated between the local, county, and regional levels, not crisis-oriented, and dynamic in its ability to meet a changing social and technological environment and future contingencies. This must be accomplished at the local rather than the federal level, because EPA has limited land use implementation ability.

Some of the possible types of local participation and regulation which would serve to mitigate the secondary growth impacts of the proposed central sewage system are:

a. Flood plain management
    - Federal flood insurance program (Chapter 1)
    - Local zoning and land use controls for flood plain development

b. Stormwater management
    - Non-point pollution source study in 208 planning area

- Retention of wetlands and other natural areas

- Site design requirements for run-off control, particularly for large developments

- Stormwater retention systems and other stormwater systems designed to reduce adverse water quality impacts

c. Erosion and sedimentation control

- Land use controls for steep slope development

- Agricultural soil conservation techniques

- Construction site management

d. Agricultural land preservation

- Reduced real estate assessments for non-development for a certain time period

- Transferable development rights; allowing farm owners to sell their development rights (not their property) to a developer, who may build with a higher density in a more developed area.

D. Biology

1. Terrestrial Biota

The proposed treatment plant site is presently a cultivated field. The only trees on the site are those along the river bank on the east side of the site. These trees are the typical river bottom species that are commonly found throughout the county. They include cottonwood, sycamore, boxelder, maples, and oaks. These trees will not be affected by this project and serve as a portion of the buffer between the plant and the areas across the river, in addition to the site landscaping. The plans for the treatment facility include the planting of various evergreen and deciduous trees around the site to provide a scenic and aesthetic buffer. The planting of these additional trees is desirable because they would provide food and cover habitat for the various birds in the area. The wildlife that might live along or near the river banks adjacent to this site should not be significantly affected by the operation of this plant and those directly displaced would be able to migrate to natural areas near the treatment facility, if the populations in the remaining natural areas were small enough to accommodate these additional individuals. Problems would arise if the adjacent habitat were too small to hold additional individuals, or if noise levels from the treatment facility were too high for wildlife to tolerate.

The woodland vegetation to be crossed by the interceptor lines for this project include such upland associations as oak-hickory areas, beech-maple areas, and river bottom areas which contain sycamore, cottonwood and boxelder trees. The oak-hickory association is found on many sections of the hilltops where the soil is low in lime content, well-drained, and, in most instances, sandy. These trees grow in soils which have a fairly low pH; thickets of laurel, blueberries, and huckleberries are prominent as their understory. The more prevalent upland wildlife species in these areas include such species as quail, rabbit, squirrel, large mammals such as deer, smaller mammals such as mice, moles, and shrew, and a variety of passerine (perching) birds. In addition, some higher food chain carnivore species such as hawks, owls, foxes, and skunks presumably inhabit these areas and have stable populations.

The beech-maple association and the typical river bottom sycamore-cottonwood-boxelder areas are common along the streams and river areas in the county. These tree types are characteristically found in the lower elevations, along watercourses, that have moist soil conditions. Wildlife species common in the upland forest areas are also usually found in these areas in fairly abundant numbers. Such species as the muskrat, mink, river otter, raccoon, possum, reptiles, and amphibians are presumably also abundant in these areas.

The use of various highway rights-of-way to install the interceptor lines will greatly reduce the amount of vegetation to be removed in construction. About 50% of the interceptors are planned to follow existing rights-of-way. The use of rights-of-way is the more acceptable method for placement of pipelines, because this location causes much less disruption to the environment than crossing tracts of natural areas. The wildlife in the areas that must be crossed by open trenches would be temporarily displaced to similar habitat areas nearby. Revegetation of construction routes will aid in habitat restoration.

Interceptor routes will avoid the significant natural areas of the county. (see Figures 2-3 and 3-1).

The adverse impacts of the facility and interceptors on terrestrial biota have been largely reduced to short term impacts, which are reversible.

2. Aquatic Biota

The possible adverse effects of chlorine and ammonia on aquatic life have been discussed in Chapter 4 and Appendix H.

Although this facility will not violate the present waste load allocation, its effluent will change the present stream conditions, because the concentration of substances in the effluent will not be identical to their present concentrations instream. These additions of substances from the effluent will probably alter the stream ecology. This is because different species have different tolerances of the various substances found in water. For example, the increases in nitrogen and phosphorus will alter the numbers of species and kinds of species of algae in the stream. This change in composition of the aquatic food supply will affect the numbers and kinds of species which feed upon the algae, and so on, to other members of the aquatic food chain. The nature and extent of these changes is extremely difficult to quantify. These impacts are short term and reversible, if the old species can migrate to the area from upstream. The impacts may be adverse below the outfall. At the same time, upstream segments of the Olentangy and the other streams will be benefitted as septic tanks are removed and water quality improves. Other streams will receive receive a similar benefit from sewering.

Stream temperature may also be affected by the effluent temperature. This could also affect the composition of stream life or their reproductive patterns. This effect cannot be quantified at this time.

Sedimentation resulting from erosion can be harmful to aquatic plants and animals. Suspended sediments can obstruct the amount light penetrating to the stream bottom and this can adversely affect the bottom-lying and floating microscopic algae. Siltation can blanket animal habitats, clog gills and respiration and interfere with filter-feeding or sight-feeding species. As discussed earlier, these adverse impacts are anticipated to be substantially mitigated, but would be of irreversibility Class II.

Five species of mollusks and fish which have been found in this part of the Olentangy River have been listed by the State of Ohio as endangered. It is very difficult to evaluate their present status in the river. Locating rare species is difficult simply because there are so few of them. In addition, the spotted darter lacks an air bladder, which makes it difficult to catch by the conventional fish-survey methods. The exact ecology of these particular species is not well understood, which complicates an evaluation of why these particular species are endangered. Some generalizations can be made, however. Ohio mollusks have a greatly reduced habitat, because of construction of artificial lakes. These animals can dwell in natural, free flowing rivers, but not in impoundments. Channel modification eliminates the natural variability of a stream bed, with a general adverse effect on the aquatic ecosystem, whose members each require or prefer a slightly different set of surroundings. The naiade mollusks have complex life cycles, involving a specific host species to harbor the larvae. If the host is not present, that species could not reproduce sucessfully. Water pollution from chemicals and sediments can adversely affect both fish and mollusks. There are fewer and fewer streams which can support a diverse, natural biological population.

The most extensive ecological studies of the Olentangy, in which insects (Olive, 1971), and fish (U.S. Fish & Wildlife Service, 1975) have been surveyed, indicate a healthy stream, which supports a good variety of desirable aquatic life. In addition, it is known that the five endangered species have been and may still be present in this segment of the Olentangy. Because of this diminishing ecosystem type, and not just the endangered species, it is important to maintain the upstream segment of the Olentangy in as healthy and unpolluted state as is possible. Tertiary treatment, phosphorus removal, and ozonation will aid in maintaining a high quality effluent to protect stream life.

E. Environmentally Sensitive Areas

1. Archeology

The interceptors will totally bypass Highbanks Park, with its three National Register archaeological sites. The treatment plant site, OR-3, has been the subject of a preliminary archaeological survey by the Ohio Historical Society. We have been in communication with the Ohio State Historic Preservation Officer (see Appendix J). Additional surveys will be made as necessary to determine the archaeological value of the site, in compliance with the procedures for the protection of historic and cultural properties of the Advisory Council on Historic Preservation (36 CFR Part 800). If mitigation is indicated, it may include salvage of cultural materials from the site prior to construction.

2. Geology/Topography/Steep Slopes

The interceptor routes will avoid the shale Highbanks bluffs.

3. Plants and Animals

The natural areas of Highbanks Park will be avoided entirely by the sewer configuration. Treatment levels have been designed to protect the high quality Olentangy biota.

4. Prime Agricultural Lands

As residential and commercial-industrial development of southern Delaware County occurs, one secondary environmental effect will be the loss of agricultural land. This is an adverse, long term effect of Class II reversibility, which might be mitigated at the local level, via zoning and/or taxation rates.

5. Recreation and Parks

Regional sewage treatment will greatly facilitate recreational development and parks around Alum Creek Reservoir.

Highbanks Regional park will be out of the path of the interceptors, which will follow highways at the edge of the park. It will be able to utilize the central treatment system for its sewage flows. The sewage treatment plant will be isolated from most areas of the park by natural trees and shrubbery, and by the landscaping and mounding surrounding the facility. At the Highbanks bluff overlook the view of the treatment plant will be similarly screened by vegetation and topography so that very little, if any, of the facilities will be noticable. This will largely mitigate this adverse long term impact. Subsequent sections will discuss aesthetics in greater detail.

The advent of sewers will facilitate development of the area, including land in the vista seen from the Highbanks bluff.

Acquisition of the property, or of scenic easements on the property, or other measures ought to be taken locally to ensure the continuance of a pleasing rural view.

Improved sewage treatment will enhance streamside recreation in the Franklin County parks along the Olentangy.

6. Flood Plains

The Olentangy Environmental Control Center is located above the historical 100 year flood plain. All of the major area streams have regulated flows, which greatly reduces the flood hazard. Liberty and Concord townships have flood plain land use regulations. New sewers will facilitate flood plain development, which is a long term, adverse impact of irreversibility Class II. This may be mitigated by local land use controls and, in participating areas, federal flood insurance provisions.

7. Aesthetics

Development permitted and encouraged by the advent of sewers will alter much of the present rural character of southern Delaware County, as the area becomes more suburbanized.

The treatment plant itself is provided with extensive controls for odors, noise, and visual appearance. (See Section F.)

8. Scenic River

The effluent discharged to the scenic river segment will be of a very high quality. The treatment facility will be screened off from the river by mounds and vegetation. Stream crossings will be designed to reduce construction damage to the stream.

The secondary growth impacts from population growth and development in the Olentangy basin may adversely impact water quality.

Recently, section 1501.17 of the Ohio Scenic Rivers Act has been declared unconstitutional by the Franklin County Court of Common Pleas. The case is presently under appeal. This section gives the Ohio Department of Natural Resources' Director the authority to approve government project outside of corporation boundaries. However, this approval is only advisory for federal actions.

9. Scenic Highway

The treatment plant will be screened from the scenic highway by extensive landscaping and mounds.

F. Aesthetics

1. Visual Impacts

The visual impact is a function of the area within which a structure may be seen, the number of people in a position to see it and the aesthetic response to this sight. The area of visibility surrounding the proposed treatment plant is determined by a line-of-sight analysis based upon the assumption of a plant height of 18 feet, a general tree height of 40 feet and an observer height of 6 feet.

It is further assumed that an observer within a wooded area could see out of it, but that an observer outside of a wooded area could not see through it. Sixteen equally spaced radial line-of-sight transects, were constructed from the plant site to the maximum limits from which the proposed plant could be seen. These transects are shown in Appendix I. An example of the graphic line-fo-sight analysis is presented in Figure 5-4.

The location of the radial transects and the interpolated area of visibility of the plant are presented in Figure 5-5.

The area of visibility is an elipse in which the major axis, about 4500 feet long, extends along the Olentangy Valley and the minor axis, about 3000 to 4000 feet long, extends across the valley. It is noteworthy that because of the roughly convex curvature of the Highbanks, the plant would not be visible from the very top of the bluffs and hill at an elevation of 890 feet above sea level, were it not for the trees which block this view. Ridges which extend normal to the Olentangy Valley and buildings, particularly in Mount Air, also obstruct visibility.

The people who might be affected by this visual impact include the fraction of the visitors to the Highbanks Park who visit the scenic overlook site at points 100 to 130 feet above the river. Also about 18-20 home dwellers in the northern part of Mount Air, about a dozen home dwellers along the Olentangy River in Delaware County south of Powell Road and drivers along State Route 315 south of Powell Road will be affected.

In this context the Highbanks Park has established three picnic areas

- On the bottomlands of the Olentangy River about 5000 feet north of the proposed plant site
- On the bluff above the Olentangy River about 4000 feet north of the proposed plant site
- On the bluff above the Olentangy River about 4000 feet north northeast of the proposed site

Except for the extensive screening provided by trees along the Olentangy River and screening provided by tree planting about the site the plant would be visible from the first site. Mounding will help to screen the site further. Because of

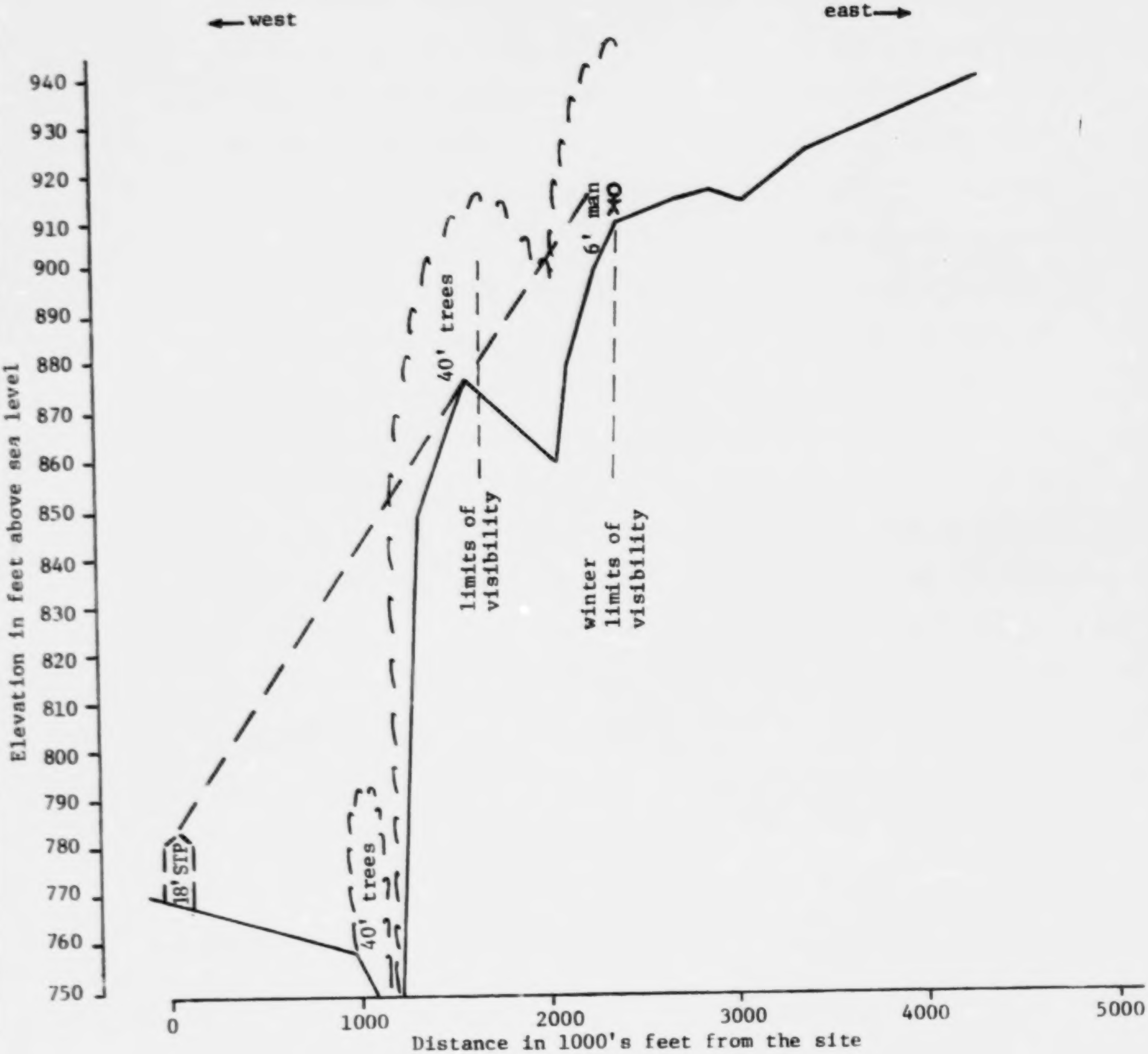
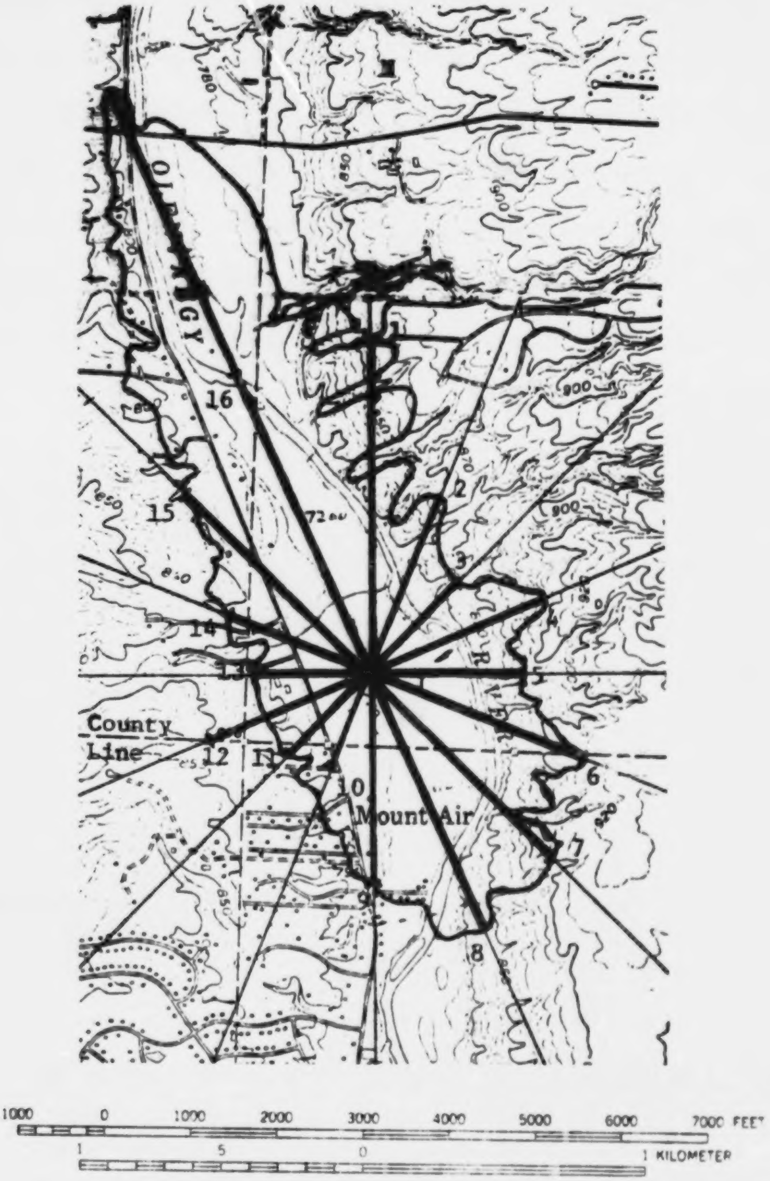


Figure 5-4 . A Line of Sight Profile (Profile 5)

Source: Enviro Control, Inc., 1975



CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL

Figure 5- 5 Area of Visibility of Proposed Plant

Source: Enviro Control, Inc., 1975

both the convexity of the topography and the screening effects of trees in an intervening ravine the plant would be obscured from the second picnic area, designed for group events. Similarly, the proposed plant would be obscured from the third picnic area both by the convexity of the topography and the intervention of trees. However, the proposed plant would be visible through the trees from certain vantage points along the proposed nature trail in Highbanks Park. This is a long term adverse effect of irreversibility Class II.

The plan for the proposed plant and the site has an unusually large number of provisions designed to enhance the visual impact. The building design is compatible with the rural-suburban character of the neighborhood and landscaping has been carefully planned to include trees and mounds that will screen the site.

2. Odor Impact

Odors in the proposed plant will occur from septic conditions in wet wells in the primary stage or as a result of upsets during the secondary stage of treatment. Substances which cause odorous emissions are hydrogen sulfide and ammonia. Other inorganic odors include sulfur dioxide or carbon disulfide. Organic odors identified are mercaptans, proteins degraded by bacteria, which often transform into various amines. The odor threshold, or minimum level detectable by people, of concentrations of mercaptans, certain amines, or hydrogen sulfide is about 10 times lower than that of sulfur dioxide, and it, in turn, is 10 times lower than the threshold for ammonia. When several odor-producing chamicals are emitted simultaneously, there are synergistic effects. However, accurate determination of these combined effects is difficult.

The sources of odors in municipal wastewater treament plants are presented in Table 5-3. These odor problems are to be prevented by proper plant design or eliminated by add-on treatment methods.

All of the unit operations in the proposed treatment plant are aerobic, hence all of the gaseous by-products produced during sewage decomposition should be theoretically, odorless. Septic odor-producing conditions may develop, however, in certain areas. These areas include the raw sewage lift station, the tertiary filter building, and the sludge concentrator building.

The raw sewage may be septic as it comes into the plant prior to its combination with activated sludge. Odor from fresh sewage is minimal and is confined to the lift station. In long sewer lines at low flow rates with no storm or ground water additions, sewage may become septic. Chlorination will be used to control odors here, as necessary.

In addition to the chemical control of odors in the raw sewage, the lift station air vent will be equipped with an ozonation system. This will effectively keep any lift station odors from reaching the outside atmosphere, and must be properly maintained in order to be effective.

The tertiary rapid sand filter and sludge concentrator building air vents will be equipped with activated carbon filters. Activated carbon will absorb and adsorb any odorous compounds and prevent their reaching the outside atmosphere.

Table 5-3. Sources of Odors in Municipal Wastewater Treatment Plants

Location	Odor Source	Comment
Sewage entering treatment plant	Gas produced by anaerobic reactions in sewer line	Certain industrial wastes can intensify the odor (food processing)
Weirs	Volatile gases escape	Minimize weir drops elevation
Screening, grit removal	Evaporation from grit, screening or wash water	
Aeration tanks or basins	Evaporation of small droplets or the collapse of bubbles causes formation of aerosols	
Heat processing of sludge	Volatile products from digestors or pressure cooking off-gases	Proper design can eliminate these odors
	Supernatant hot liquors and warm sludge	Cooling reduces odor
Ponds or holding tanks	Usually caused by anaerobic reaction	Aeration will prevent odor
Sludge handling and solid/liquid separation	Conveyors, filters, trucks, landfills, and drying beds	Proper sludge treatment can eliminate odor
Sludge incineration	Incomplete combustion	Proper design and operation will eliminate these odors

Source: Liptak, 1974

Proper maintenance is the responsiblilty of the plant operator and is necessary to ensure adequate odor control. The wastewater from the periodic backwashing of the tertiary filters will be returned to the aerators for treatment. Therefore, no odor problems will result from filter backwashing.

Any odor problems are a reversible adverse impact, of short or long term, depending upon their origin. These measures will mitigate these adverse effects.

3. Noise Impact

Unwanted sound, or noise, is generated by most mechanical equipment including that proposed for the Olentangy Environmental Control Center. Noise can have an adverse impact on people that ranges from simple annoyance to psychological stress. The extent of the impact depends primarily on the loudness, pitch, intermittency, and familiarity of the noise reaching sensitive human receivers (Wolsho *et al*., 1974).

Noise levels are typically measured in decibels in the "A" scale (dBA). The scale emphasizes a certain set of frequencies to which the human ear is most sensitive. Examples of common indoor and outdoor noise levels are listed in Figure 5-6.

Noise can be attentuated, i.e., reduced, before it reaches sensitive human receivers. Distance, vegetation, and topography, including hills and walls, can reduce noise levels significantly. Vegetation must be quite dense to attenuate noise. In a dense evergreen woods with a visibility of 70-100 feet, the attenuation of sound is approximately 18 dBA per 1000 feet. Trees with tall trunks to a height of 6 to 8 feet and spaced about 10 feet apart provide no attenuation (Embleton

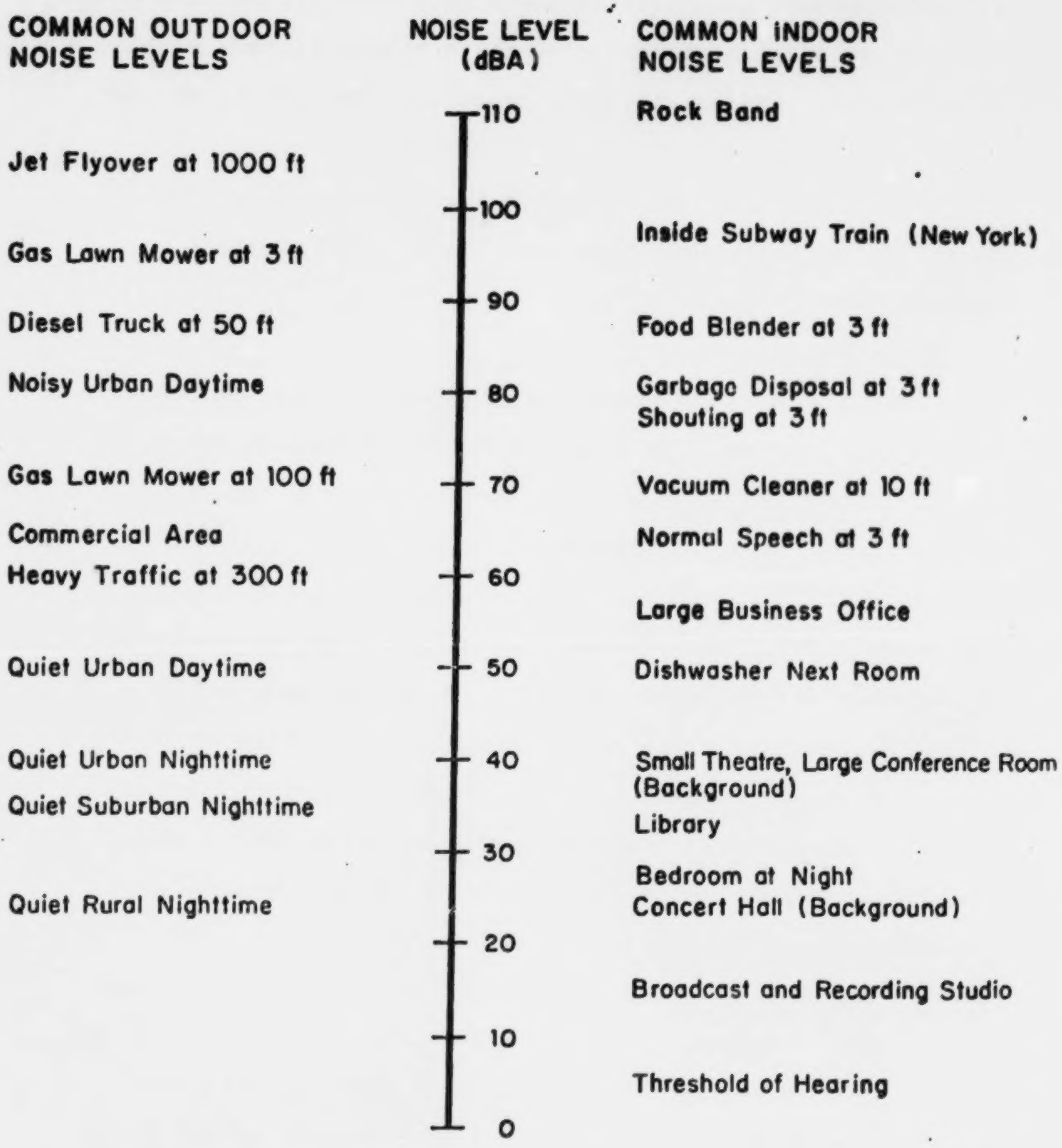


Figure 5-6 . Common Indoor and Outdoor Noise Levels

Source: U.S. Department of Transportation, 1973 and Thiessen, 1962). Planting vegetation to improve the aesthetic appearance of the noise-generating area has also been shown to reduce local sensitivity to noise without actually reducing the noise levels (Sexton, 1969).

The treatment plant equipment that may cause a significant noise impact on receivers outside the plant area includes the blowers and the emergency power generator. The large pumps will also produce high noise levels, but this equipment will be located below ground level and the noise impact will be limited to plant personnel who must service this equipment.

The nearest non-plant receivers include a residence and a park approximately 400 feet and 1000 feet away, respectively, from the proposed site of the blower building. Ambient noise levels measured in the park ranged between 35 dBA and 45 dBA, with a bird call raising the level to 52 dBA (Battelle, 1973). The blowers, with their piping and blow-offs are capable of routinely producing noise levels exceeding 100 dBA at a distance approximately three feet from the uncovered operating equipment (Allis Chalmers, Inc., 1975). However, this equipment would be housed in a structure with 8-inch thick cement block walls, 1-1/4-inch thick urethane insulation, and 5/8 inch thick redwood veneer. If the blow-off is either vented inside the building, or adequately muffled and vented outside, the total noise level immediately outside the building should be consistently below 90 dBA. Using a maximum noise level of 90 dBA immediately outside the building, the noise levels at various distances from the building are shown in Table 5-4.

Table 5-4. Maximum Anticipated Noise Level in dBA at Various Distances from the Proposed Blower Building

Distance in ft.	50	100	200	500	1000	2000
Noise Level in dBA	78	75	72	68	64	57

Source: Enviro Control, Inc., 1975

These levels are derived by the dissipation law of sound pressure, assuming the absence of sound barriers. The Delaware County Engineer has provided the following noise data from existing wastewater treatment plants:

Somerset, Ohio 0.25 mgd

Positive displacement blowers - outdoors

50 ft. - 73 Decibels

200 ft. - 56 Decibels

800 ft. - less than 50 Decibels - could not hear blowers

Oberlin, Ohio 2.3 mgd - Single stage - 3 blowers

Centrifugal Blowers - inside brick building

Readings taken with windows open

5 ft. outside of window - 87 Decibels

50 ft. - 71 Decibels

200 ft. - 56 Decibels

Waverly, Ohio 1.0+ mgd - Single stage - 3 blowers

Centrifugal Blowers - inside brick building

Reading taken with windows open

50 ft. - 76 Decibels

200 ft. - 54 Decibels

McConnelsville, Ohio 0.5 mgd - Single stage - 3 blowers

Centrifugal Blowers - inside brick building

Readings taken with windows and doors closed

50 ft. - 66 Decibels

200 ft. - less than 50 Decibels

These buildings are of block with brick veneer, but lack vegetation or topographic screening. The noise levels diminish more rapidly than the theoretical values presented in the preceeding table.

The treatment plant site will be surrounded by existing and planted vegetation, and mounds, which will serve as additional sound barriers. Lagging the piping, i.e., covering it with sound-deadening insulation, may further reduce outside noise levels, if this is necessary. (Allis Chalmers, Inc., 1975). These precautions, together with the distances to the sensitive receivers, (see Figures 5-3, 5-4) should result in a minimum acoustical impact from this noise source. Moreover, the strategic placement of the blower building and emergency power generator housing with regard to existing and proposed topography, and the planting of aesthetically pleasing vegetation, should ensure local acceptance of the minimum acoustical impact. The remaining noise levels are an adverse short or long term impact of a reversible nature.

G. Reliability

The subject of reliability can be broken into two major topics. These are the probability of meeting an effluent standard specification for a given material, or effluent reliability, and the percent of time that a system is in full operation, or system reliability. Reliability data for wastewater treatment are very limited in amount at the present time. EPA's Municipal Environmental Research Laboratory in Cincinnati has compared the proposed Olentangy Environmental Control Center to an existing 1.5 MGD tertiary treatment facility at Ely, Minnesota. The Ely plant includes flow equalization, two-stage lime clarification, dual-media filtration, and chlorination. Three years of operating data were analyzed, and the conclusion made that the tertiary plant on-line system reliability was 99.27%. The plant had 5 or 6 operators and two mechanics on the day shift, two operators on the afternoon shift, and two operators on the night shift, and was supervised by a full-time graduate sanitary engineer. Good reliability was related to the process piping flexibility, dual unit process utilization, and operator attention.

The proposed Delaware County facility has good piping flexibility and dual unit construction. The County has recently improved the design from better than Class II reliability, to Class I reliability, the most stringent group, by improvements to the standby electrical system (USEPA, 1973). The treatment units will be located above the 100 year flood elevation. A standby generator may be used in the event of a power failure. At the 1.5 MGD phase, the interceptor sewers may safely store wastewater for up to 16 hours without causing sewage backup problems in homes. A detailed alarm system is built into the treatment process monitoring equipment. Industrial wastes, a major cause of process failure, are at a minimum in the service area. Radio service will be provided, in case of telephone failure.

A stockpile of emergency equipment and spare parts will be maintained for the system. The Operation and Maintenace Manual will include a section on emergency operations. In addition, no bypass to the stream is designed either in the treatment plant or interceptor system. Personnel schedules for operating the plant have not yet been made.

Effluent reliability may be statistically described by a central value, the geometric mean, and a measure of the expected deviation, the spread factor. The value of the geometric mena will depend on the details of the treatment process. The spread factor has been more uniform for the plants studied, ranging from 1.5 to 2.2. The higher the spread factor, the less reliable the process. The spread factor for Delaware County is estimated at 1.7, by comparison with the existing El Lago, Texas two stage nitrification treatment plant. This means for example, a random sample of the effluent would have an ammoninium nitrogen level of 0.2 to 0.6 mg/l, at the 85% confidence level.

H. Impact Summary

1. Short Term - Adverse

- Stream turbidity
- Energy consumption during construction
- Pressure community services
- Speculation
- Disruption of terrestrial biota
- Impact on aquatic biota
- Noise impacts from the treatment plant
- Odor impacts from the treatment plant

2. Long Term - Adverse & Beneficial

- Returning water frrom the Olentangy to the Olentangy (beneficial)
- Transfering some water from the Olentangy to the Scioto River (adverse)
- Reduction of groundwater recharge (adverse)
- Meet present water quality standards and the waste load allocation (beneficial)
- Reduction of septic tanks (beneficial)
- Decrease in coliform bacteria in Olentangy (beneficial)
- Cleaner water supply (beneficial)
- Stream sedimentation (adverse)
- Air quality changes (adverse)
- Interceptor presence (beneficial)
- Treatment plant presence (adverse, but serves a beneficial purpose)
- Energy consumption during operation (adverse)
- Building materials commitment (adverse and beneficial)
- Landfilling sludge (adverse)
- Population growth (beneficial and adverse)
- Possibility of greater housing variety (beneficial)
- Soil loss from erosion (adverse)
- Loss of prime agricultural land (adverse)
- Loss of habitat (adverse)
- Air pollution from population growth (adverse)
- Development away from streams (beneficial)
- Impact on aquatic biota (adverse and beneficial)
- Flood plain development (adverse)
- Visual impacts of the treatment plant (adverse)
- Noise impacts from the treatment plant (adverse)

- Odor impacts from the treatment plant (adverse)

3. Irreversible/Irretrievible

a. Class I absolutely irreversible

- Energy consumption - construction and operation
- Labor - construction and operation
- Commitment of building materials

b. Class II irreversible for all practical purposes

- Returning water to the Olentangy from the Olentangy
- Transfering some water from the Olentangy to the Scioto River
- Reduction of groundwater recharge
- Turbidity and sedimentation
- Air quality changes
- Landfilling sludge
- Interceptor presence
- Treatment plant presence
- Soil loss
- Farmland and habitat loss
- Development away from streams
- Flood plain development
- Visual impacts of the treatment plant

I. Mitigation Summary

1. Specific Conditions

- Discharge permit has been issued by the State
- Sewage treatment
  * tertiary
  * phosphorus removal
  * ozone disinfection
  * discharge location
  * odor and noise controls
- Erosion and sedimentation control at treatment plant site and along interceptor routes
- Landscaping - plant site and interceptor rights-of-way
- Archaeological mitigation, if necessary
- Aerosol mitigation, if necessary
- Service of Muirfield Village and Shawnee Hills by the Scioto Interceptor (Dublin grant)

2. Advisory recommendations

- Outfall design
- Stream crossing methods
- Explore sludge use on land
- Local planning efforts and land use controls
- Improving Delaware City treatment plant (Delaware City grant)

CHAPTER 6
FEDERAL & STATE AGENCY COMMENTS AND PUBLIC PARTICIPATION

A. Previous Public Hearings and Meetings

1. Public Hearing on the Environmental Assessment

The hearing on the Olentangy Environmental Control Center and Interceptor Sewers for Subdistrict 1-A of the Delaware County Sewer District, Delaware County, Ohio was held at 10:00 a.m. on Tuesday, January 29, 1974, at the conference room of District Six of the Ohio Department of Transportation, Delaware, Ohio.

Major issues discussed:

* proper planning and provision for future development and growth in the county

* avoid water pollution problems which now exist via sewage treatment facilities

* coordinate the sewer system with the new water system

* problem soils in the county for septic tanks; malfunctioning

* local sewer planning efforts to connect into the county interceptors

* impact of the project on natural areas and reducing harmful impacts to the Olentangy area

* conflict of proposed site with Highbanks Park

* petition (144 signatures) citing inadequacies of the Environmental Assessment and requesting an EIS on project

* desire for more information about sewer routes and phasing and population served

* history of sewer planning effort

* possibility/probability of treatment plant breakdown

* alternate treatment plant location by I-270 to also serve Worthington Hills

* impacts of population growth on transportation and schools

* financing of the project -- with and without new development

* high degree of sophistication of the treatment system

A complete transcript is included in the Facilities Plan.

2. Public Hearing on the Facilities Plan

The hearing on the Sanitary Sewerage Facilities Plan for South-Central Delaware County, Ohio was held at 10:00 a.m. on Wednesday, July 31, 1974, in the Common Pleas Court Room, Courthouse, Delaware, Ohio.

Major issues discussed:

* problem of poor soils and malfunctioning septic tanks

* EIS for the project requested

* impact on Scenic River, on Highbanks Park

* petition presented at the January hearing

* phasing of sewers and dates of construction

* adequacy of capacity of the treatment facilities

* alternative of going to Columbus

* possibility of meeting the future "no discharge" alternative

* irreversible and irretrievable aspects of the project--loss of farmland, river valley

* odors and noise from treatment plant

* impact of sewer line construction

* impact on Bartholomew Run area by the interceptors

* serving existing problem areas first

* have water system and now need sewer system to handle the wastewater

* impact on Olentangy mollusks and other biota

* take time to do good planning before development

* land use rights and restrictions

A complete transcript is included in the Facilities Plan.

3. Summary of concerns raised at the USEPA Community Workshop May 21, 1975, 7:30 p.m. Olentangy High School Delaware, Ohio.

Major issues discussed:

* sludge disposal
* overloading of interceptors
* EIS process, delay and rising project costs
* Columbus use of Delaware County for water supply
* compatability of a treatment plant with its surroundings
* need for orderly and coordinated development afforded by sewage treatment
* Highbanks view; seeing area for oneself
* serving present sewage problems vs. future growth
* noise, odor problems of treatment plant
* existing malfunctioning septic tanks
* needs of county residents vs. county visitors
* protection of water supply
* question of diverting water from different basins
* recycling of effluent
* What site alternatives were proposed?
* Possibility of connecting to the Columbus interceptor line which ends at Worthington Hills.

B. Correspondence Received Relating to the Draft EIS - US EPA
(* = letter reproduced in Appendix J)

1. Federal

Senator John Glenn	July 2, 1975
Congressman Samuel L. Devine	August 24, 1973 October 12, 1973 April 17, 1975 May 28, 1975 July 2, 1975

U.S. Dept. of the Interior, Bureau of Outdoor Recreation	April 5, 1974 April 10, 1975
U.S. Dept. of the Interior, Fish & Wildlife Service	* July 21, 1975
U.S. Army Corps of Engineers, Ohio River Division	April 11, 1975
U.S. Army Corps of Engineers, Huntington District	April 16, 1975 May 15, 1975 July 31, 1975

2. State

Representative Mike Stinziano	August, 1975
Representative Walter D. McClaskey	April 15, 1975
Representative Lawrence E. Hughes	April 15, 1975
Ohio Department of Natural Resources	April 30, 1975 August 13, 1975
Ohio Department of Transportation	April 16, 1975
Ohio Environmental Protection Agency	January 14, 1975 March 11, 1975

3. Local

Delaware County Regional Planning Commission	April, 1975
Mid-Ohio Health Planning Federation	April 28, 1975
Health Department, Delaware City and County	April 11, 1975
City of Westerville, City Engineer	April 9, 1975 June 5, 1975
W.R. York, Mayor, Galena	April, 1975
Metropolitan Park District of Columbus and Franklin County	November 4, 1974 December 12, 1974 February 5, 1975 March 6, 1975 March 14, 1975

March 24, 1975
April 8, 1975
June 10, 1975
July 3, 1975
August 12, 1975
August 21, 1975
August 27, 1975

4. Correspondence Received from the Public Relating to the Draft EIS by USEPA (* = letter reproduced in Appendix J)

The Nature Conservancy,	Ohio Chapter
Rivers Unlimited,	Cincinnati
Trent D. Sickles,	Columbus
Mary Lynn Jacobsen,	
Susan B. Henrickson and Wade-Shuta Campfire Girls,	Worthington
Nationwide Development Co.	Columbus
Barbara M. Cape	Powell
Roger Maize	Delaware
Larry H. Lape	Delaware
Del-Co Water Co.	Delaware
Ohio Conservation Foundation	Cleveland
J. Vaughn Barnhard	Westerville
* Walter T. Momot	Columbus
Richard S. McCutchen	Columbus
Lynn Edward Elfner	Delaware
* John R. Schutte	Powell
* Carol B. Stein	Columbus
Edmond L. Robbins	Harlem Twp.
Ronald C. Sloter	Delaware
E. Osborn	Delaware
Carl E. Evans	Delaware
Delaware County Farm Bureau Federation	Delaware
Don E. Fisher	Powell
Porter Twp. Trustees	Sunbury
Larry Mitchell	Ostrander
Liberty Twp. Civic Association	Powell
Thomas E. McNamara	Delaware
C.B. Percy	Lewis Center
Charles H. Perkins	Westerville
John D. Wolf	Delaware
John G. Whitney	Sunbury
Russell Tones	Delaware
Sierra Club, Central Ohio Group	
John H. Law	Delaware
Edward A. Bischoff	Powell
Karen L. Rodde	Delaware
George W. Hockaden	Powell
K.E. Snyder	Delaware
Concord Twp. Trustees	Delaware
John A. Chapman	Powell
L.R. Schreiber	Delaware
Delaware Area Chamber of Commerce	Delaware
Virgil E. Newell	Lewis Center
Ralph E. Scott	Delaware

Jane & Robert Smith	Columbus
Clifford W. Andretch, Jr.	Dublin
Mack Fulton	Delaware
David Wallace	Columbus
James D. Klingbeil	Powell
John J. Hohl	Westerville
Sharon Heit & class	Columbus
Robert L. White	Columbus
Mr. & Mrs. B.T. Mindlin	Columbus
John C. Gunnin	Columbus
Ohio Equities, Inc.	Columbus
James M. Merkel	Columbus
Patrick E. Blayney	Westerville
Von Hill	Columbus
Everett Baxter	Radnor
Del-Co Water Co.	Delaware
Walter T. Momot	Columbus
John R. Schutte	Powell
League of Women Voters	Delaware
Lovell M. Parsons	Westerville
Lisa Roberts	Columbus
Nick Gatz	Worthington
Sondra L. Davis	Worthington
Mary Gene Maher	Worthington
Jane A. Healey	Columbus
Mrs. Russell Davis	Powell
Dorothy R. Schaffner	Columbus
William Havener	Columbus
David Wallace	Carroll
*Ohio Biological Survey	Columbus

5. Summary of Issues Raised in Letters to USEPA prior to Draft EIS;

    1. Request for the preparation of an Environmental Impact Statement.
    2. General interest in participating in the Draft EIS.
    3. Inadequate Environmental Assessment; need to examine alternatives; land disposal.
    4. Aggravating and expensive delays in the construction of needed sewage treatment facilities.
    5. Immediate sewage problems in southern Delaware County; poor soils for sewage treatment; health hazard and water pollution implications.
    6. Impacts of sewage effluent on water quality and aquatic life in the Olentangy; State Scenic River.
    7. A central sewerage system is imperative for sound, orderly development, and growth and prosperity in Delaware County.

8. A central sewerage system subsidizes new development, without serving existing development.

9. Downstream impacts of effluent in Franklin County on the Olentangy River.

10. Pollution in the Alum Creek watershed and effect on Westerville drinking water supply.

C. Public Hearing on the Draft EIS

This hearing was held on Tuesday, March 16, 1976, from 2:00-5:00 pm and from 7:00-11:00 pm at the Berlin Township House, Delaware, Ohio.

Complete hearing transcripts may be viewed at USEPA, Region V, Chicago, the public libraries in Columbus and Delaware, Ohio, and at the Delaware County Engineer's Office.

Following is a hearing summary and the responses of USEPA. (C=Comment and R=Response.)

1. Earl Richards, Deputy Director, Ohio Environmental Protection Agency

C= Mr. Richards indicated that Ohio EPA supported the system presented in the Facilities Plan, as approved by Ohio EPA.

R= Ohio EPA certified the Facilities Plan in January 1975.

C= Development will continue to occur without a central sewage system. On-lot or package plants will pollute ditches and major water bodies.

R= This has been noted in the "no action" alternative discussion in Chapters 3 and 4.

C= The extended outfall proposed in the Draft EIS would be environmentally disruptive; both it and additional treatment would be too costly and not cost-effective.

R= The problems with the extended outfall are discussed in section G-1, Chapter 4. Conclusions or additional treatment are found in section E-2 of Chapter 4.

C= Ohio EPA has verified conclusively that water quality requirements can be met with the treatment plant proposed in the Facilities Plan.

R= Chapters 4 and 5 address water quality impacts, including those pertaining to chlorine and ammonia.

C= Flow figures for the Olentangy River have historically been greater than those reported in the Draft EIS. OEPA records for 1955-1974 indicate the lowest flow of record as approximately 13 cfs.

R= The low flow discussion has been expanded in section E-2 of Chapter 2.

C= A computer analysis has been made by OEPA and shows that chlorine removal would be necessary only under certain conditions to prevent toxicity to aquatic life. Ammonia levels will be safe.

R= Our discussion of chlorine and ammonia is in Chpater 4 and Appendix H.

C= A need exists for proper sewage treatment.

R= Agreed.

2. Fred Stultz, County Engineer, Delaware County

Mr. Stultz presented an overview of the treatment plant and interceptors proposed in the Facilities Plan, with the assistance of:
Paul Shephard, Burgess and Niple, Ltd.
Al Siler, Burgess and Niple, Ltd.

3. Gary Gilbert, Assistant Sanitary Engineer, Delaware County

Mr. Gilbert addressed comments made in a letter from Delaware County to USEPA. These will be discussed in the following section of this chapter.

4. Clyde E. Lewis, Special Counsel, Delaware County Commissioners

C= Mr. Lewis discussed the poor present water quality of the Olentangy River.

R= Water quality is discussed in section E-3 of Chapter 2, and in Appendix B.

C= The effluent will be 98.5% pure.

R= A high quality effluent is needed to meet the NPDES Permit, Appendix A.

C= No fish are in the Olentangy because of the management of the Delaware Dam. There is extensive fishing in local reservoirs.

R= The first statement is not supported by U.S. Fish and Wildlife research, of fish populations and fishing use, Appendix J. Local reservoirs are stocked to improve fishing.

C= The project will benefit Franklin County by providing a cleaner water supply.

R= This benefit is noted in section A-4 Chapter 5.

C= Sewage treatment will be a benefit.

R= See Chapter 5.

5. John W. Arthur, USEPA Environmental Research Laboratory, Duluth, Minn.

C= Dr. Arthur discussed the total residual chlorine level of the proposed effluent. He recommended a lower level of 0.003 mg/l, in concurrences with the February 19, 1976 memo of Dr. William Brungs, (see Appendix J). Studies relating to the toxic levels of chlorine on freshwater fish and invertebrates were cited.

R= This level has been adopted for the Final EIS, Chapter 4.

6. Robert L. Trowbridge, Vice President, Powell Merchants Association

C= Mr. Trowbridge indicated that the 32 members of his association support central sewage treatment for southern Delaware County, (as proposed in the Facilities Plan), to support human needs and growth.

R= Comment noted.

7. Von Hill, Director, Environmental Research and Action

C= Mr. Hill indicated that his group is statewide with about 50 members, and asserted that local Congressman Sam Devine did not support recent water pollution control legislation.

R= Mr. Hill later clarified his position on Congressman Devine's voting record, see late letters.

C= A high-voltage power line crosses the service area and residents in the area of these lines have experienced increased static electricity and interference in communications.

R= This power line already exists and will not be influenced by the proposed project.

C= Secondary impacts on land use have not been fully explored in the Draft EIS; no economic analyses of increased costs of governmental services.

R= A detailed regional or economic plan is beyond the scope of this EIS, as noted in section C of Chapter 5.

C= Air pollution was dismissed in draft EIS.

R= This section has been augmented in Chapter 5.

C= There was no discussion of solid waste or of possible air pollution from incineration.

R= Solid waste services are discussed in section C of Chapter 5. Incineration of sludge is not proposed, see section E of Chapter 3.

C= There may be open burning at construction sites.

R= Regulation of this would be a local responsibility.

C= Land disposal of sludge as fertilizers is desirable; wood chips from construction may be used in a composting process. Compost can prevent dangerous pathogens and will not contain any dangerous heavy metals to harm the soil. Extensive use could be made of the compost.

R= Composting is discussed in section E of Chapter 3.

C= There is a need for improved sewage treatment, but he would prefer a different site.

R= Site conclusions are made in Chapters 3 and 4.

C= A second public hearing in Northern Franklin County is indicated.

R= This is not possible because of time restraints. Many Franklin County residents attended this March hearing.

8. Jo Ann Gieseke, Alliance of Northwest Communities
Ms. Gieseke indicated that her group represents nine civic associations in Columbus and Arlington. The group adopted a resolution on March 8, 1976, opposing construction of the sewage treatment plant, unless there are no adverse effects on Highbanks Park and the Olentangy River. They request a more complete EIS on the alternatives.

R= Comments noted.

9. Dwight Ely, speaking for Mr. and Mrs. Courtland P. Ely, parents

C= Mr. Ely indicated that his parents desire modern sewage treatment. His family has been familar with the area's septic tank problems. The central sewage system will be well designed and reduce pollution of the Olentangy River.

R= Comment noted.

C= Delaware County has given much to Franklin County in the past and now it is time for reciprocation.

R= Comment noted.

10. John D. Wolf, President-Elect, Delaware Area Chamber of Commerce

C= Mr. Wolf stated the long-time support of his group for a new sewage treatment system. It is important for orderly development. People within the county have spent many years planning the system.

R= Planning was initiated in 1969.

C= He feels that existing problems are more important than the possibility of fish kills. The average stream flow is high enough so that chlorine would not be a problem.

R= While the average stream flow is high, low flow conditions present serious biological problems unless mitigative measures are used.

C= Mr. Wolfe presented a demonstration indicating dilution of chlorinated effluent by the stream.

R= Section E-2 of Chapter 4 and Appendix H discusses chlorine impacts in detail.

11. Dayton D. Robbins, Superintendent, Division of Sewerage and Drainage, Columbus Department of Public Service.

C= Mr. Robbins indicated support for most of the conclusions of the Facilities Plan. He objected to the extended outfall proposed in the Draft EIS. The stream biota is presently surviving in a polluted stream.

R= The extended outfall is discussed in section F of Chapter 4.

C= There are park areas below the extended discharge outfall and there would be an environmental impact on Columbus. Having the discharge of effluent remote from the treatment plant would encourage poor operation of the facilities.

R= Parkland areas have been noted in section G of Chapter 4. Reliability is included in section G of Chapter 5.

C= Building improved fish habitat would be more cost-effective than 2.7 miles of 42 inch sewer. If an extended outfall is used, treatment should also be upgraded.

R= Preservation of this natural portion of the Olentangy River is encouraged. The habitat construction was designed to mitigate some of the adverse effects of stream channelization. Treatment additions are discussed in section E-2 of Chapter 4 and in Appendix H.

12. Roger Wells, Superintendent of Parks, Department of Recreation, Columbus

C= Mr. Wells indicated that his department is in the city park system, which differs from the County Metropolitan System. The Department is concerned about impacts to the Olentangy River in the Columbus area because they already own 460 acres of parkland along this stream. Sewage effluent could impair recreational use of river. The Watercourse Plan has designated area between Olentangy and State Route 315 as Priority I parkland and endorses preservation of open space around Highbanks Park.

R= Parks along the Olentangy River are discussed in section J-5 of Chapter 2.

13. George R. Gehrkens, Olentangy Scenic River Advisory Council

C= Mr. Gehrkens stated that poor quality in the Olentangy detracts from its enjoyment.

R= Section E-3 in Chapter 2 presents water quality data.

C= His group feels that the sewage treatment plant is necessary for river clean-up. Presently, raw sewage flows to the river.

R= Central sewage treatment will remove part of the Olentangy pollution load and gradually aid in eliminating septic tanks, as sewer lines are extended.

C= The river is scenic and there is a need to preserve open space as the county grows.

R= Agreed.

C= A greater guaranteed minimum release could augment flow in the Olentangy River.

R= This would be very difficult to achieve, and is discussed in section E-2 of Chapter 2.

14. Michael McClaran, West Lakeview Residents Association, Columbus

C= Mr. McClaran noted the potential danger to aquatic life from chlorine and ammonia during low flows.

R= Section E-2 of Chapter 4 and Appendix H cover these topics.

C= Interceptors would encourage extensive exploitation of this part of the county by land developers and speculators. There is a problem of growth for its own sake.

R= Extensive speculation has already occurred in Delaware County, as noted in Chapter 2, section H.

C= Development on the flood plain would be encouraged.

R= Some townships have flood plain land use regulation, and some areas will be subject to flood insurance requirements.

C= Aesthetic qualities of Highbanks Park would be diminished.

R= Section E-5 of Chapter 5 addresses park impacts.

C= A regional system has advantages, and he urges it adoption.

R= Chapter 4 compares local and regional alternatives.

15. Larry R. Schreiber

C= Mr. Schreiber emphasized that improved sewage treatment is necessary, citing groundwater pollution problems prior to the development of a central water utility.

R= A building ban was in effect prior to the development of the Facilities Plan.

C= There is a need for a priority of human needs over biological impacts; proceed with the project.

R= A properly designed project can serve both human and biological needs.

16. Ken Manning

C= Mr. Manning stated that clean water and proper sanitation are essential. He feels that extensive planning has gone into all phases of the project and that he is pleased with this sort of governmental service.

R= Comment noted.

17. Thomas W. Singell, Westerville City Engineer

C= Mr. Singell stated that he was representing the City of Westerville and that the City has sent letters to EPA indicating concern over water quality in the Alum Creek basin. A central sewage treatment system is necessary to protect water supplies.

R= The letters have been received by USEPA and are reproduced either in the Draft EIS or later in this chapter. Phase I of the proposed system is designed to protect the Westerville Reservoir.

18. Carl H. Fritsche, Trustee, Del-Co Water Company

C= Mr. Fritsche supports a central treatment facility for the future health and growth of the county. He indicated the extensive planning efforts of the County Commissioners on the project to respond to a need.

R= Comment noted.

19. Vincent G. James

C= Mr. James stated that he had been critical of the wastewater treatment plant for a long time. He feels that its prime benefit is to developers.

R= Homes to be served in Phase I are discussed in section C-4 of Chapter 4.

C= Lots of sincere, hard work went into the Facilities Plan but the Plan won't solve the existing problems for many years.

R= Facilities planning is for a 20-year period. Phase I of the project, presently being funded, can serve only a portion of the planning area.

C= The Columbus treatment plant smells bad and isn't working well.

R= Solids processing has created problems at the Columbus facilities. This will be addressed in the forthcoming EIS on the Columbus Facilities Plan.

C= The Draft EIS doesn't discuss using package plants. They can be made to operate correctly and malfunctions will only hurt a small area. Package plants would save money in interceptor construction and have greater flexibility.

R= The package plant alternative was discussed in the Facilities Plan.

C= The federal grant should go to serve the existing population.

R= Federal grants are used to fund cost-effective projects. Phase I includes 600 existing homes, and has been determined to be cost-effective. The present population is widely scattered, which makes sewering everyone at once very difficult.

C= There is a lack of enforcement of septic tank regulations, and a real need for enforcement.

R= Septic tank ordinance enforcement is a county responsibility.

C= The EIS should consider the alternative of septic tank maintenance.

R= This is included in section A of Chapter 3.

20. John Yiamouyiannis

C= Dr. Yiamouyiannis discussed the reservoirs constructed in Delaware County and the need for stream clean-up. Rivers are used, and the pollution is discharged downstream.

R= Comment noted.

C= Nitrates are a potential health hazard in drinking water. Chlorinated hydrocarbons from chlorination, are a potential health hazard in drinking water.

R= Section A-4 of Chapter 5 and section E-2 of Chapter 4 and Appendix H discuss these issues.

C= There is a need for truely modern on-lot systems, with recycling toilets and a grey-water system. This would reduce pollution and be less prone to obsolescence.

R= See section A of Chapter 3 for this topic.

C= The cost per household of the proposed system is very high and the money could be used for a system that is better inits long-term concept.

R= Costs are detailed in section C-3 in Chapter 4. Federal funding cannot be used for some types of systems.

C= The proposed system is supporting developers.

R= Much of the land in the area is being held for speculation or planned for development. Thus any system that EPA can fund has the potential of being used by new development. Existing homes are discussed in Chapter 4, section C-3.

21. Patrick R. Dugan

C= Mr. Dugan stated that the problem was what to do with the effluent, rather than whether or not to provide adequate waste treatment. Need for a metropolitan approach.

R= Comment noted.

C= Sending effluent to Worthington seems to be an admission of the potential low quality of the effluent.

R= The extended outfall is discussed in section G-1 of Chapter 4. Additional treatment is discussed in section E-2 of Chapter 4.

C= Working plants don't achieve 98.5% removal.

R= The efficiency of this tertiary plant must be high enough to achieve its discharge permit conditions. Section G of Chapter 5 discusses reliability.

C= All treatment plants are designed with a bypass.

R= This one is not, either in the treatment facility or the interceptor system.

C= BOD and suspended solids in the Olentangy are inevitable.

R= At controlled levels, to meet permit conditions.

C= The use of chlorine is creating potential problems.

R= Section E-2 of Chapter 4 deals with this issue.

22. Morris Robinson

C= Mr. Robinson stated that central sewage was necessary for high density development and that few present residents would benefit from it.

R= The phase being funded (Phase I) will serve 600 existing homes and the equivalent of 430 homes of park and commercial flows.

C= The County Health Department should enforce regulations on existing systems.

R= This is a county responsibility.

C= People have been saying that the river is muddy, rather than bad.

R= High turbidity has been observed in the Olentangy by EPA. Section E-3 of Chapter 2 discusses water quality.

23. Jack M. Foulk, Administrative Assistant to Congressman Chalmers P. Wylie

C= Mr. Foulk read a letter from Chalmers Wylie which protested the proposed treatment plant site as being noncompatible with Highbanks Park.

R= Park impacts are covered in sections E-5 and F of Chapter 5.

C= The treatment facility would also impact riverside parks and residential areas in Columbus and Worthington.

R= Downstream parks are addressed in section E-5 of Chapter 5.

C= Chlorine and unionized ammonia would harm fish, as indicated by the Fish and Wildlife service.

R= Section E-2 and Appendix H discuss this.

C= Regionalization would be better environmentally and financially.

R= Chapter 4 compares local and regional choices.

24. Robert W. McAdams, Manager, Del-Co Water Company, Inc.

C= Mr. McAdams addressed his company's interest in a high quality river, and present hazards from on-lot treatment systems.

R= Coliform levels are high in the stream, at times. The bacteria are attributable from upstream treatment facilities and the on-lot systems.

C= There is a need for good sewage treatment.

R= Agreed.

25. John R. Schuette

C= Mr. Schuette stated that the altenative chosen should meet the needs and budget of the area.

R= Agreed.

C= River crossings will be limited by construction costs. Silt will not be a problem because of rock bottom and because of high releases from the upstream dam.

R= Section D-3 of Chapter 4 discusses stream crossings.

C= Concern for fish kills by Franklin Co. is unwarrented because of post fish kills from the municipal zoo's package plant on the Scioto River.

R= Later phases of this system will eliminate this package plant.

C= Salt used on highways near the Olentangy River hasn't killed fish.

R= Controlling these chemicals is important to protecting the river.

C= The need for good sewage treatment should outweigh concerns for fish.

R= Proper sewage treatment systems will also be designed to protect fish and other aquatic animals and plants.

C= The possibility of dilution through an increased minimum release would be a solution.

R= The increase of the minimum release is covered in section E-2 of Chapter 2.

C= There are real difficulties in on-lot systems working in the local soils.

R= This has been noted in section C of Chapter 2.

26. Philip S. Jastram, Clintonville Area Commission, Columbus, Ohio

C= Mr. Jastram indicated that good care must be taken of river resources. There is a need to resolve all questions before the treatment plant is built.

R= This is the purpose of the EIS process.

C= He expressed concern over chlorine and ammonia levels and impact on fish.

R= Section E-2 and Appendix H discuss these topics.

C= There is a need to understand secondary impacts and development.

R= As discussed in section C of Chapter 5, a detailed land use plan is beyond the scope of this EIS. Presently, 208 planning may be initiated in the area by Ohio EPA.

27. William D. Angol

C= Mr. Angol stated that good sewage treatment to meet human needs is more significant that fish.

R= Good sewage treatment will meet both needs.

C= Concern for the health of children playing in streams was expressed.

R= Proper effluent disinfection is essential at the existing and proposed treatment facilties.

28. Carl Berke

C= Mr. Berke noted the upstream growth of Columbus and growth into Delaware County. Delaware County must bear the cost of this. The sewage system is necessary.

R= Comment noted.

C= The effluent, however, presents problems for the quality of the stream.

R= Impacts of effluent is discussed in Chapters 4 and 5.

C= The solution is a regional sewage system to correct the problems of the area, on a long term basis.

R= Regional and local alternatives are compared in Chapter 4.

C= No 208 planning was undertaken in the region when funds were available for it.

R= Section 208 planning has been encouraged by EPA.

29. James Brimeyer, City Manager, Worthington

C= Mr. Brimeyer objected to the extended outfall, which would be located in Worthington and discharge in a residential and proposed park area, which is not addressed in the Draft EIS. The outfall is not the least-cost mitigative alternative, and will have adverse social and environmental impact. The cost will probably be greater than that stated in the draft

C= EIS. Constructing the outfall will create extensive damage along Route 315.

R= Section G-1 of Chapter 4 discusses the extended outfall.

C= Additional treatment would protect all aquatic life and human activities, along with Type I outfall.

R= Additional treatment is studied in section E-2 of Chapter 4 and in Appendix H.

C= Flow augmentation from Delaware Lake dam or additional retention areas are an alternative.

R= Section E-2 of Chapter 2 covers the difficulties of this proposal.

C= Worthington would not support granting easements for the outfall.

R= Comment noted.

30. Otis Huff

C= Mr. Huff stated that area rivers are being polluted by package plants and septic tanks. A treatment plant would do a better job.

R= As the interceptor lines are extended, local water quality will improve.

C= Much good agricultural land has been used for reservoirs to supply water for Franklin County.

R= Comment noted.

31. Gary R. Moore

C= Mr. Moore opposes the treatment plant site proposed in the Draft EIS because of its adverse impact to Highbanks Park.

R= Park impacts are covered in Chapter 5, sections E-5 and F.

C= There is clearly a need for improved sewage treatment, but by a facility which will not multiply the problems.

R= Agreed.

C= Many existing problem areas won't be served until 1996. Development areas will be served in the first phase.

R= The planning has been undertaken for a 20-year period, and not just for the immediate grant. As has been discussed in the EIS, speculation is occuring in all portions of the planning area.

C= Chlorine will eliminate a high quality fishery, and State Endangered Species.

R= Correction for this is proposed in section E-2 of Chapter 4.

C= Use of the extended outfall would just move the problem downstream.

R= Section G-1 of Chapter 4 discusses this difficulty.

C= Noise levels will be in conflict with park use.

R= Noise mitigation is covered in section F-3 of Chapter 5.

C= Any odors would blow towards the park, with the prevailing southwest winds.

R= Odor control is discussed in section F-2 of Chapter 5.

C= In the Draft EIS, 14 of 22 impacts are adverse.

R= Adverse and beneficial impacts may differ in degree, as well as in kind. The net effect of this facility would be beneficial. Adverse impacts may often be mitigated.

C= Alternatives which much be considered are: upgrading on-lot treatment and regionalizaing with Columbus, along with a 208 Plan.

R= Federal funding cannot be used for on-lot systems. Regionalization is discussed in Chapter 3 and 4. USEPA has encouraged 208 planning for the Columbus area.

32. Helen Gross, Greater Clintonville Community Council, Inc., Columbus

C= Ms. Gross stated that the officers and trustees of her group unanimously oppose the proposed treatment plant site because of conflicts with the park and impact on aquatic life.

R= Comment noted.

C= They recommend the study of other alternatives.

R= Alternatives are covered in Chapter 3, including some new regional ones.

33. Tom H. Nagel

C= Mr. Nagel asserted that the EIS lacks essential data. Water quality data are old and sketchy.

R= Additional water quality data have been added to Appendix B.

C= Question of air-borne pathogens is inadequately addressed.

R= Section B-2 of Chapter 5 expands upon this issue.

C= There is no detail on how existing sewage problems will actually be eliminated. This make it impossible to assess the proposed beneficial impact. Few of the existing problem areas will be served by Phase I.

R= House counts are presented in section B-3 of Chapter 4. The dispersed population patterns of the area make it difficult to provide interceptors to everyone at once. Water quality in the Olentangy will be improved by this project and by improvements to the Delaware City facilities.

C= Alternatives to a sewage treatment plant are poorly addressed; should a plant be built at all? Alternatives include: Petaluma-type limited growth ordinances;

R= These ordinances would be a local rather than a federal responsibility. A building ban was previously imposed on the county.

C= Use disincentive water rates;

R= Part of water comes from wells. Del-Co Water Company might consider this alternative.

C= Flow reduction measures;

R= Section A of Chapter 3 covers flow reduction.

C= Strict enforcement of septic tank ordinances and scheduled inspections of septic tanks;

R= Enforcing county laws is a county responsibility.

C= Condemnation of properties presenting a public health hazard.

R= This is a local responsibility.

C= The sewage treatment plant will degrade the scenic segment of the Olentangy. There is a lack of interceptors to these areas.

R= Development along the Olentangy is presently scattered and this makes it difficult to sewer.

C= Pollution in the Olentangy from the upstream Delaware city treatment plant is a problem.

R= This is presently being addressed in a Plan of Study to improve treatment facilities. A stricter discharge permit may be imposed in 1977, when the present permit expires.

C= One secondary impact would be erosion and sedimentation from residential development.

R= Ordinances to control this would be a state or local responsibility.

C= Impacts of chlorine and ammonia will kill fish. Aquatic life below the extended outfall is also valuable.

R= Chapter 4 deals with these problems.

C= The region serves as a buffer zone between Columbus and Delaware.

R= Southern Delaware County is largely rural, at present.

C= Fifteen of 22 long term impacts are adverse. All short term impacts are adverse.

R= Because of differences in degree, and mitigation possibilities, the net result is a benefical project.

C= Secondary impacts are inadequately addressed. A New Jersey study indicates that the problems created may exceed the problems solved.

R= We obtained a copy of this study in the middle of our analysis of secondary impacts. Time did not permit the application of its analytical methodology to this project in more detail.

C= Draft EIS states that 95% of the pollution comes from Delaware plant upstream; only a net improvement of 5% for a massive expenditure.

R= The project will also benefit the Scioto and Alum Creek Watersheds. Substantial improvements also are planned at Delaware City.

C= There is a need for more emphasis that the project will serve developers rather than existing residents. Phase I serves 2 large potential developments and 13.4% of the existing population. Not until Phase III will half of the present population be served. This is a misuse of public funds.

R= A diffuse population is difficult to serve. Six hundred existing homes are in the Phase I area, plus additional park and commercial areas.

C= "Environmental Control Center" is a euphanism.

R= This is the name used in the Facilities Plan.

34. W. Raymond Mills

C= Mr. Mills reference the Columbus Watercourse Plan. He expressed concern over the impacts to fish from chlorine and ammonia levels, particularly during the treatment

C= plant malfunctions. There should be no malfunctions.

R= Reliability is covered in Chapter 5, section G. Chlorine and ammonia are dealt with in Chapter 4, section E-2 and Appendix H.

C= The existing Delaware sewage treatment plant is the best location alternative, if the plant were upgraded to the proposed level for the Olentangy facility.

R= Chapter 3 discusses the difficulties of this alternative.

C= This would also aid in relieving existing pollution problems.

R= Plans are being made for improving the Delaware City facility.

C= Regionalizing the Scioto River and Alum Creek basin with Columbus would eliminate the need for future Olentangy River plant expansion, with its possible detriment to the stream. It will be in the best interest of Columbus to protect its water supply.

R= Chapter 4 compares local and regional alternatives.

C= Secondary impacts will be generated, such as increased energy consumption, but people's freedom of choice will be maintained. Ideally, no additional population growth should be generated.

R= Costs to the homeowner for septic tanks or central sewage service willl be comparable in Delaware County, for the first year. Sewer charges are lower in Franklin County than are proposed for Delaware County, which would make the Columbus area more attractive. Detailed local planning is beyond the scope of this EIS, as described in section C of Chapter 5.

C= Costs should be equivalent to a septic system to reduce secondary impacts, rather than less than septic tank costs. Any surplus funds generated could be used for better operating personnel, for malfunction prevention, or to aid existing residents to be connected to the system.

R= Costs are developed in Chapter 4, section C-3.

35. Joseph M. Demarchi, Alum Valley Association, Worthington

C= Mr. Demarchi stated that his group represents about 100 members living in the Alum Creek Dam area. They are in favor with proceeding with the system presented in the Facilities Plan.

R= Comment noted.

C= Regionalization with Columbus would provide poor service and doubled charges, to what city residents pay.

R= Service charges are covered in Chapter 4, section C.

36. A. J. Coyle, President, Knolls Civic Association, Columbus

C= Mr. Coyle stated that his group represents 1500 families on the west bank of the Olentangy River. They are concerned about possible malfunction of the proposed facility. This would degrade the biological, recreational, and aesthetic qualities of the river.

R= Reliability issues are discussed in section G of Chapter 5.

C= Regionalization with Delaware City would provide many benefits.

R= Chapter 3 discusses why this would be a problem.

C= It will be 20 years until some existing residents are served.

R= This is the length of the planning period.

C= Flows do seem low at times in the Olentangy.

R= Section E-2 of Chapter 2 covers low stream flows.

37. David Wallace, Sierra Club, Central Ohio Group

C= Mr. Wallace said that his group recognizes the need for adequate wastewater treatment, but feels that the Draft EIS inadequately addresses primary and secondary impacts. There needs to be an analysis of economic, ecological and sociological conditions affecting growth.

R= A growth study to this degree of detail is beyond the scope of this EIS. Impacts have been addressed for the proposed treatment plant size and for a future expansion. If growth is slower than has been described here, the addition would not be made or would be made at a later date. Chapter 5 addresses impacts for the chosen alternative.

C= Is the growth desirable?

R= This is a local judgment.

C= This growth will have impacts on energy and resources.

R= Chapter 5 addresses this.

C= More impacts are adverse than beneficial in the Draft EIS.

R= The degree of impacts makes the net result of the project beneficial.

C= Local planning effoorts necessary to mitigate are not described in the detail.

R= Detailed development of plans is a local responsibility, see section C-3 of Chapter 5.

C= Using the extended outfall is an uncoordinated approach to solving the problem. Impacts will still occur downstream.

R= Our present position is covered in section G-1 of Chapter 4.

C= Lack of evidence of health hazard from airborne pathogens does not mean that one does not exist.

R= Section B-2 discusses the pathogen issue in Chapter 5.

C= Regional alternatives with Columbus need to be considered; you may have an advantage in incoming flows at the treatment plant, due to lags in travel time.

R= Chapter 4 compares local and regional alternatives.

C= Flow reduction was not seriously considered.

R= Section A expands on this topic in Chapter 5.

C= Powell and Shawnee Hills should be served in Phase I.

R= Section B-1 of Chapter 3 discusses the status of the Powell grant. The alternatives for Shawnee Hills are covered in Chapter 3, section C-9.

C= The no action alternative was given little consideration.

R= Section G of Chapter 3 and A of Chapter 4 cover this alternative.

38. Robert S. Dixon

C= Mr. Dixon stressed that the proposed system would not solve the existing problems for 20 years and that the costs would far exceed those of inspecting and enforcing present systems.

R= Twenty years is the usual planning period for the Facilities Plan. Costs for the proposed system may be seen in Chapter 4. Enforcement is Delaware County's responsibility.

C= Development need not be a self-fulfilling prophecy.

R= Development is subject to local controls.

39. Richard P. Fahey

C= Mr. Fahey discussed the legal means for instituting regionalization. He indicated that while a regional water and sewer district must be approved by local government, either a conservancy district or a sanitary distict may be formed by citizen petition. These alternatives are essential for the EIS.

R= The legal discussion has been expanded in section C-9-e, Chapter 3.

C= The Water Pollution Control Act Amendments speak of restoring and maintaning waters.

R= Agreed.

40. Frances Pierce

C= Ms. Pierce discussed the present sewage problem in the county and the need for effective planning on a regional basis.

R= Agreed.

C= Area residents have a genuine problem in getting septic tanks to work.

R= Agreed.

C= Land use planning is needed, rather than denial of sewage services to manage area growth.

R= This sort of planning presently occurs at the local level.

C= She is willing to pay her share of the cost for effective treatment. There is a need to go ahead and build the best system to serve problem areas.

R= Comment noted.

C= Questions citizen control of a conservancy district. What is the public recourse?

R= Conservancy districts are covered in section C-9-e of Chapter 3.

41. Nancy W. Ingling

C= Dr. Ingling emphasized that the proposed treatment plant would serve developers and solve few existing sewer problems.

R= The project has been planned in phases. Six hundred existing homes plus other flows are in the Phase I area.

C= There are questions of reliability and of the possibility of achieveing a silent, odorless facility.

R= Reliability is covered in section G, in Chapter 5. Odor and noise control is discussed in Chapter 5, section F.

C= A scenic river and populated residential area is a poor treatment plant location. This will lower the quality of life for people.

R= Chapters 3 and 4 present sites and site selection.

C= She favors regionalization with existing Columbus plants.

R= Regionalization conclusions are covered in Chapter 4.

42. Marilyn Sue Kinsey

C= Ms. Kinsey stated that she was opposed to the proposed treatment plant site because it would impare residential areas and occupy a distinctively beautiful site. An alternate location is necessary.

R= The conclusions of the Final EIS are developed in Chapters 4 and 5.

43. Marie Hensel

C= Ms. Hensel recommends that funds could best be used for upgrading on-lot treatment systems.

R= Federal funds aren't eligible for this purpose; it would have to be a local effort.

C= Developers will be benefited by a central system.

R= So will homes with present septic tank problems.

44. Robert Beynon

C= Mr. Beynon emphasized that the sewage problem is a Delaware County matter and that the county, by itself, must solve the problem.

R= EPA is responsible for the use of its 75% grant for funding the project.

45. Barbara M. Cape

C= Ms. Cape stated that septic tanks are not a compatible area solution. Package plants have maintenance problems that are difficult to control.

R= Agreed.

C= Absence of central sewerage won't hold back developers. With a central system, better quality treatment may be obtained.

R= Agreed.

C= Doesn't like the treatment plant location, but regionalization would limit the control of the system.

R= Section C-9-e of Chapter 3 covers institutional considerations.

46. Allan Ichida

C= Mr. Ichida stated that the Olentangy River is a potential health hazard, due to pollution. Now is the time to clean up the stream.

R= Water quality data are presented in Appendix B and Chapter 2, section E-3.

47. John D. Wolfe

C= Mr. Wolfe emphasized that planning has been ongoing since 1969 to try to produce sewage treatment facilities.

R= Agreed.

C= Low flow fish kills are less of a problem than continued stream pollution.

R= Both are problems that this EIS seeks to resolve.

C= Reservoirs in the area have limited discharge point alternatives.

R= Agreed.

C= The Metropolitan Park District had agreed to the treatment plant and discharge point of the Facilities Plan.

R= A copy of this legal agreement is reproduced in the Facilities Plan.

48. John Yiamouyiannis

C= Dr. Yiamouyiannis stressed that viable on-lot treatment is possible.

R= Sections A and B of Chapter 4 discuss this topic.

C= The planned system won't correct existing problem areas.

R= Some of the problem areas, notably in the Alum Creek basin, will be served by Phase I.

C= On-lot solutions would aid in preserving low population density.

R= This is true under the present County septic tank ordinance.

C= He questions the cost per customer and who will be paying for these costs.

R= Costs are discussed in Section C-2 of Chapter 4.

C= On site inspections and enforcement are weak.

R= This is the responsibility of Delaware County.

49. Clyde E. Lewis, Special Counsel, Delaware County Commissioners

C= Mr. Lewis stated that Franklin County's concern about environmental quality in Delaware County has been recent, and these are poor reasons for preventing construction of needed treatment facilities.

R= Comment noted.

50. Neil Looker

C= Mr. Looker indicated that some Franklin County residents had been previously concerned with the construction of dams in Delaware County; their environmental interest wasn't recent. He stated that sewer lines have been constructed in areas of Franklin County and are unused.

R= Comment noted. Sewer capacity in Franklin County will be discussed in the EIS on the Columbus Facilities Plan, in preparation by EPA.

C= There would be some support for regionalization by the people of Columbus.

R= Some persons have indicated this at the hearing and in letters to EPA.

51. Dean Miller, Delaware County Commissioners

C= Mr. Miller indicated that Columbus refused the regionalization alternative in 1969 because of sewer capacity.

R= Delaware County has documented this by a copy of the letter in the Feasibility Survey. (Burgess and Niple, 1970) Appendix J

C= The county is changing and must plan to meet these changes.

R= Agreed.

52. Jim Whitney, Delaware County Commissioner

C= Mr. Whitney expressed county pride in the scenic segment of the Olentangy River, lying entirely within Delaware County, and with deciding for its future.

R= Comment noted. The scenic river extends to I-270 in Franklin County.

53. Kenneth Reed, Delaware County Commissioner

C= Mr. Reed emphasized that people should contact the county for the details of hook-ups to their homes. The county would be glad to listen to reasonable arguements, and has spent seven years planning and collecting information.

R= The plans and specifications are available at the County Engineer's office.

54. Lee Surrey

C= Mr. Surrey indicated that he wanted the exact statistics on the number of homes that the project would serve and cost clarification.

R= Section C-3 of Chapter 4 details this information.

55. Henry Shaw, Delaware County Prosecutor

C= Mr. Shaw cited examples of treatment facilities in Pennsylvania which were not nuisances and which improved their environment.

R= Comment noted.

D. Correspondence received by USEPA commenting on Draft EIS.

1. Letters - received by March 31, 1976.

#1

Delaware County Engineer

[illegible] STREET
DELAWARE, OHIO [illegible]
TELEPHONE [illegible]

[illegible]

February [illegible]

[illegible] ENVIRONMENTAL PROTECTION AGENCY
RECEIVED

Mr. Harlan [illegible]
[illegible] Environmental Protection Agency
[illegible]
[illegible]
[illegible]

Re: Delaware County, [illegible]
Project No. [illegible]

Dear Mr. [illegible]:

[illegible] on February [illegible], 1976, with Mr. [illegible] [illegible] Washington, we were requested to [illegible] on the [illegible] Environmental Control Center and [illegible] [illegible] by the County on February [illegible], 1976.

[illegible] public hearing is scheduled for March [illegible], 1976, this request was made by Mr. [illegible] in order to [illegible] at the hearing. [illegible] that [illegible] is available for the public hearing.

Therefore, the following comments are [illegible] to facilitate [illegible]

1. [illegible] of extended outfall or additional ammonia removal and [illegible]
   a. Flow in the [illegible] River
      [illegible]

      It appears to be questionable that [illegible]

Mr. Harlan [illegible] 2 February 23, 1976

It appears on Figure [illegible] that the 7-day, 10-year low flow of the Olentangy River has been based on the [illegible] Water Company [illegible] This is [illegible] that the [illegible] in direct conflict with the statements made on page [illegible] that the [illegible] Water Company will not withdraw water from the Olentangy [illegible] Also Figure [illegible] does not provide for any [illegible] on the Olentangy River from the [illegible] to the Delaware-Franklin County line [illegible] feet [illegible]

[illegible]

[illegible] available for [illegible] 1962-[illegible] [illegible] flow [illegible] as follows:

Water Year	CFS
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	12.[illegible]

The 7-day one in 10-year low flow for the period 1962-1973 is 10.7 cfs. Therefore, the [illegible] cfs figure should be used in dilution ratio computations of Figure [illegible]

If the ammonia and [illegible] levels in the proposed plant effluent are as [illegible] that consideration may need [illegible] flow augmentation from the [illegible] off-stream reservoir for use in [illegible] reservoir could be filled from [illegible] or from the effluent from the proposed plant.

b. [illegible] treatment plant:

The [illegible] wastewater plant is located approximately [illegible] Franklin County line and approximately [illegible] The plant effluent discharge is to the [illegible] riffle area. The ammonia [illegible] Olentangy River is reported in [illegible] Report under U.S. EPA Contract [illegible] Control, [illegible] of [illegible] [illegible] reported in the [illegible] to [illegible] and was obtained from the [illegible] It should be noted [illegible] a much greater effect [illegible] Environmental Control Center. If [illegible] then it [illegible] as reported [illegible] concentration from the Worthington [illegible] In fact as noted in Table 4 [illegible] wastewater plant [illegible] of this fish survey, the amount of game fish found below the [illegible] wastewater plant discharge is greater than above [illegible]. Therefore, it appears that the proposed effluent discharge of the Olentangy Environmental Control Center should not [illegible] effect on the Olentangy River since the concentrations [illegible] lower.

Also, it must be pointed out that the Corps of Engineers [illegible] release large amounts of water in order to provide [illegible] at the Delaware Dam. This flushing action undoubtedly [illegible] the establishment of a high quality fishery [illegible] below the Delaware Dam.

c. Construction of outfall sewer

One alternative described in the draft EIS as a mitigative measure is for the effluent line to be discharged below I-270 and the [illegible] fish habitat area. It appears that the physical [illegible] this effluent line from the [illegible] south of I-270 may be insurmountable. There are a number of [illegible] drainage culverts, [illegible] as well as existing sanitary [illegible] and [illegible] Costwise would be [illegible].

The terrain in the vicinity of Mount Air also would [illegible] struction of a sewer along SR 315, where differences [illegible] 30 feet or more would be encountered within the right of way. [illegible] regards to construction outside the right of way, adjacent to SR 315, existing homes are located close to the right of way and would [illegible] construction by the open-trench type excavation and would [illegible] construction to be by tunnel methods [illegible] homes.

Soil borings for both the proposed plant site and the [illegible] sewer indicate the probability of rock being encountered [illegible] struction along SR 315, especially in the Mount Air area.

If it is physically possible (which we doubt) to construct [illegible] sewer along SR 315, the figure of $1,[illegible] for the [illegible] appears very low considering the conditions described above.

The County questions the possibility of [illegible] struction of the outfall sewer within the right of way of SR 315 and the crossing of I-270. These considerations are discussed [illegible] in the "Final Report Under U.S. EPA Contract No. [illegible]" prepared by Enviro Control, Inc. as found on pages [illegible] could be obtained there is still the [illegible] (also significant inflationary costs) [illegible] by affected Franklin County residents.

d. Public input in regards to final effluent discharge location

It is noted that the annual cost for the ammonia removal and [illegible] chlorination is $57,[illegible] per year as compared to the outfall sewer cost of $[illegible] per year. On page 4-[illegible] of the draft EIS the [illegible] stated: "Although the extended outfall has a higher annual [illegible]

---

the more cost effective alternative. This is because there are large [illegible]

[illegible]

Yours very truly,

[illegible], P.E.
DELAWARE COUNTY SANITARY ENGINEER

cc: [illegible]
[illegible] Planning Branch, EPA Region [illegible]

#2

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Environmental Research Laboratory-Duluth, Duluth, Minnesota 55804

SUBJECT: Draft Environmental Impact Statement for the Olentangy Environmental Control Center and Interceptor System DATE: 19 February 1976

FROM: William A. Brungs, Ph.D.
Assistant Director for Water Quality Criteria

TO: Mr. Harlan Hirt
Planning Branch, EIS Preparation Section
Region V

THRU: Donald I. Mount, Ph.D.
Director

I have not reviewed this EIS in detail but I did note two references to Brungs, 1975 (pages 4-18 and Appendix I-6) which apparently is a personal communication from August 1975 in relation to the 0.01 mg/l chlorine recommendation for warmwater fish.

Since that time I've completed an updated literature review on this topic. One of my conclusions is that recent data on some warmwater species indicate that they are as sensitive as the trout and salmon. Consequently, the former warmwater/coldwater distinction no longer appears justifiable and a single criterion for continuous exposure conditions would be 0.003 mg/l (total residual chlorine). This is also the recommendation in the Blue Book and the most recent draft of the proposed EPA Quality Criteria for Water.

If you or your staff have any questions please call (FTS 783-9546).

cc: Ms Kathy Grissom

ENVIRONMENTAL PROTECTION AGENCY
RECEIVED
FEB 23 1976
PLANNING BRANCH - Region V

#3

[illegible] Rd.
Worthington, Ohio 43085
February 23, 1976

Ms. Kathy Grissom
Water Quality Planning Section
U.S. EPA
230 South Dearborn St.
Chicago, Illinois 60604

Dear Ms. Grissom:

As a concerned citizen who regularly takes advantage of the recreational potential of the Olentangy River north of Columbus, Ohio, I have reviewed the Draft EIS on Delaware County's proposed Sewage Treatment Plant [illegible] with extreme interest. Generally, I am satisfied with the results of the statement, and I realize trade-offs must be made in this day and age. The best alternative with the least environmental impact is to tie the system in with the City of Columbus, but the EIS points out this is not realistic.

The alternatives to this seem reasonable. My chief interest in the project is pinpointed by the discussion on pages 4-25 to 4-27 of the Draft EIS. Since the plant obviously has to be built, the only correct way to do it is to mitigate effects on one of the few remaining natural areas in central Ohio at what seems to be a reasonable cost. Again, there are unfortunate trade-offs to be made, but I believe the proper design should incorporate additional treatment to make the river below the outfall safe for all aquatic life. The alternate solution, to locate the outfall below [illegible] simply [illegible] the problem and passes it on to the City of Columbus [illegible] extends right up to the [illegible] with more planned. [illegible] important in this lower reach of the river, this does not seem a rational approach since the technology to remove free chlorine and ammonia from the effluent exists. Surely, there must be ways to minimize the chances of malfunction of this additional treatment process during [illegible] conditions. This would overcome the Draft EIS's main objection to this alternative.

I am concerned about one additional item. A Delaware County engineer has been quoted in the local newspapers to the effect that they will fight [illegible] treatment on the basis that the [illegible] flows used in the Draft EIS were not correct. [illegible] should be based on guaranteed minimum release [illegible] from Delaware Dam. [illegible] argument with discharge data [illegible] from [illegible] stations [illegible]. This, together with the [illegible] Water Company's intent to increase removal from the [illegible] proposed STP seem to argue

Ms. Kathy Grissom
Page 2
February 23, 1976

favorably against this contention. Indeed, I have personally observed mid-summer conditions where flow rates were non-existent to the point that algae blooms developed in large expanses of the river.

Thank you for offering those of us interested in a rational approach to a knotty problem the chance to be heard.

Sincerely,

Bernard Griswold

#4

CITY OF WESTERVILLE
21 SOUTH STATE STREET
WESTERVILLE, OHIO
43081 · 614 882-7377

Council-Manager Government Since 1916

March 2, 1976

United States Environmental Protection Agency
Region V
230 Dearborn Street
Chicago, Illinois 60604
ATTN: Mr. Harlan D. Hirt, Chief, Planning Branch

RE: Delaware County Commissioners, Delaware, Ohio
Sanitary Sewer Interceptor System and Activated Sludge Facility
Input - Draft Environmental Impact Statement
Project # C 390690-01

Gentlemen:

This will supplement our letters of April 8, 1975 and June 5, 1975 on the subject project and provide input for the Draft Environmental Impact Statement.

On February 23, 1976, the City of Westerville Water Superintendent collected samples at four points in the Alum Creek watershed and examined the samples for total coli and fecal coli as follows:

Point 1 - Alum Creek Reservoir outfall.
Point 2 - Indian Run tributary.
Point 3 - Alum Creek at the Franklin-Delaware County Line.
Point 4 - Intake at the City of Westerville Water Treatment Plant.

The results of the testing was as follows:

	Total Coli	Fecal Coli
Sample, Point 1	123/100 ml	12/100 ml
Sample, Point 2	672/100 ml	330/100 ml
Sample, Point 3	56/100 ml	213/100 ml
Sample, Point 4	1200/100 ml	356/100 ml

[illegible] the rapid increase in [illegible] from 19[illegible] through the early part of 19[illegible] and continues to demonstrate the deterioration of the water quality in the Alum Creek watershed.

Over this time the chlorine [illegible] has continued to increase from 33 pounds per million gallons of raw water treated to 47.3 pounds per million gallons.

The cost per million gallons of water treated has increased from $[illegible] in 19[illegible] to $[illegible] in 19[illegible].

The continued deterioration of the quality of the water in the Alum Creek watershed is a concern of the City of Westerville because of health considerations and increased costs of water treatment.

The records show similar deterioration in the other watersheds contiguous to the treatment facility [illegible].

We urge your favorable consideration of the Delaware County proposal for construction of new treatment and interceptor facilities.

Very truly yours,

[illegible]
City Engineer

[illegible]
cc: [illegible], City Manager
[illegible], Delaware County Engineer
File

#5

Delaware County Engineer

[illegible]
[illegible]
[illegible]

[illegible]
[illegible]

March 10, 1976

ENVIRONMENTAL PROTECTION AGENCY
RECEIVED
MAR [illegible] 1976
PLANNING BRANCH - Region V

Mr. Harlan Hirt
United States Environmental Protection Agency
Region Five
Planning Branch
230 South Dearborn
Chicago, Illinois 60604

Re: Delaware County, Ohio
Project No. C390658

Dear Mr. Hirt:

Upon further review of the draft EIS for the Olentangy Environmental Control Center and Interceptor System, we offer the following comments which are in addition to our letter of February 23, 1976.

1. We have studied the consideration for extension of the outfall sewer along S.R. 315 to a point opposite Longfellow Avenue. A profile was prepared from available data (S.R. 315 and I-270 highway plans, [illegible] Hills Subdivision plans, City of Columbus sanitary sewer plans, and U.S.G.S. topographic maps) along with a few field elevation checks, utilizing the route as shown on Figure 3-7 (page 3-13) copy attached. Based on this profile, we have estimated the construction cost to be $[illegible], based on receiving bids by October 1, 1976. Two prints of the profile sheet are attached as Exhibit "A" along with two copies of the estimate of construction cost marked Exhibit "B".

   In order to clear the various obstacles that exist along the route, it will be necessary to outlet the sewer at the Olentangy River below the [illegible] but downstream of last rock riffle and into the sump [illegible]. A concern [illegible] this would be whether siltation might occur [illegible] a [illegible] discharge to the Olentangy River.

   Upon conference with the Ohio Department of Transportation, Division Six, it appears that the only location available along S.R. 315 from the County Line to the vicinity of northern termination of relocated S.R. 315 ([illegible] Interchange) is within the paved area. Therefore, the construction [illegible] reflect the costs necessary for pavement restoration. If this outfall sewer is constructed, this would mean that S.R. 315 in the vicinity of the construction would have to be closed to traffic, creating a substantial detour.

   It has been brought to the county's attention that the City of Worthington has a proposed park along the east side of the Olentangy River from S.R. 161 to [illegible] Bridge Road. Attached please find one set of the site plans [illegible] of this park facility.

The City of Worthington has expressed objection to the county with the termination of an outfall sewer opposite Longfellow Avenue, particularly in regards to their proposed park. This possible opposition was mentioned in the "Final Report under U.S. EPA Contract No. 68-01-2853" prepared by Enviro Control, Inc., of Rockville, Maryland on page 9.

2. In regards to the alternative of additional treatment of dechlorination and ammonia removal, the following are items for consideration.

   a. Dechlorination. The need for this is questioned in light of actual Olentangy River flows which were described in our earlier letter.

   b. Ammonia Removal. The need for this is also questioned in light of actual Olentangy River flows which were described in our earlier letter.

   Nitrogen present in wastewater is in the form of organic nitrogen (N), ammonia (NH_4), and nitrates (NO_3-). The two-stage biological process employed by the proposed plant was designed to aerobically convert the nitrogen in the form of ammonia to the nitrate form (nitrification).

   The process of denitrification is applicable to the removal of nitrogen from wastewater when the nitrogen is in the nitrate form. Anaerobic denitrification is the nitrogen removal process requiring chemical conditions which are favorable to the reduction reaction of nitrate nitrogen.

   The EIS proposes the need of additional ammonia removal. However, the anaerobic environment in the process proposed will not support the oxidation reaction necessary to convert the ammonia nitrogen to nitrate nitrogen. Therefore, in our opinion, anaerobic denitrification will not accomplish the additional ammonia removal. As an example, see attached Table 3-2 of a plant performance utilizing the nitrification and denitrification processes from the "Process Design Manual for Nitrogen Control" published by U.S. EPA, dated October, 1975. Notice that the mean ammonia content in the nitrified and denitrified effluent remained the same.

   On page I-17 of the draft EIS, a retention time of approximately 13 days in the anaerobic denitrification unit is described. However, we are unable to find in the "Process Design Manual for Nitrogen Control" published by U.S. EPA, dated October, 1975 any length of time approaching this. A ten day retention time for a 1.5 mgd plant would require 15 mg of storage volume and any future expansion would likewise require further storage volume.

If additional oxidation of ammonia nitrogen is required beyond the capabilities of the two stage biological process (1st stage carbonaceous, 2nd stage nitrification), then [illegible] ammonia [illegible] as discussed on page I-19 of the draft EIS would be a cost effective alternative and would be necessary only during the low flows of the Olentangy River. In the "Final Report under U.S. EPA Contract No. 68-01-2853" prepared by Enviro Control, Inc. of Rockville, Maryland on page 25, the following is stated:

> "By the addition of extra volume and the provision of adequate detention time, the ammonia can be completely oxidized, resulting in the formation and release of elemental nitrogen gas."

On page I-21, Table I-4, for the anaerobic denitrification, the capital cost is shown as [illegible] dollars. [illegible] that for a 1.5 mgd plant the capital cost is [illegible] [illegible] on a [illegible] basis [illegible] of the plant? Also, the [illegible] cost is shown to be [illegible] based on the 1.5 mgd plant capacity, this would amount to [illegible], which appears to be in error. Perhaps the table should show capital costs in dollars and the costs in [illegible] in order to provide a meaningful, useful table for such comparisons such as Table I-3 on page I-8.

3. There are some sewers that are part of Phase I improvements which have been omitted from Figure 3-1 (page 3-2) and Figure [illegible] (page [illegible]). Also, the sewers immediately north of Powell Road and east of U.S. 23 which are shown as Phase I, should be shown to be constructed by others. The sewers east of the Scioto River and immediately north of the [illegible] sewer line which are shown as part of Phase III should be shown to be constructed by others.

In reiteration, we again point out that the denitrification processes are not ammonia control processes.

These comments have been assembled from our additional reviews of the draft EIS and we reserve the right to forward additional correspondence pertinent to the EIS process thru the comment period.

Yours very truly,

Fred L. Stults, P.E.
Delaware County Sanitary Engineer

Gary W. Gilbert, P.E.
Assistant Sanitary Engineer

FLS/GWG:dcs
Enclosures
cc: [illegible]
[illegible]
[illegible]
Burgess & Niple, Limited
Commissioner Samuel L. [illegible]
Senator Robert Taft, Jr.
Mr. [illegible], Region V, Planning Branch, EIS Section (?)
Senator John Glenn

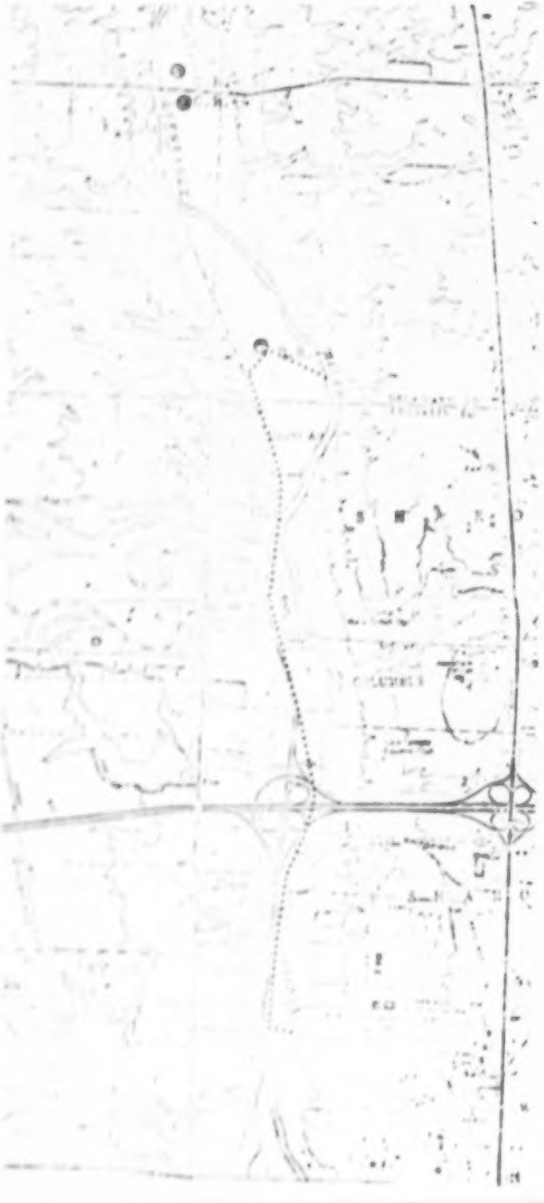


Figure 3-7.

Powell Road-
Olentangy Alternatives
and Outfall Route
Alternatives

EXHIBIT "B"

DELAWARE COUNTY, OHIO
ALTERNATE OUTFALL SEWER ALONG STATE
ROUTE 315 FROM PLANT TO SOUTH OF I-270

ESTIMATE OF COST

The following estimate of construction cost is based on prices to October, 1976, for the alternate outfall sewer from the [illegible] Environmental Control Center to a point approximately [illegible] miles downstream. The alignment is as shown on Figure [illegible], page [illegible], of the Draft Environmental Impact Statement dated January, 1976.

Description	Quantity	Unit	Unit Price	Amount
42" R.C.P. in Pavement, 8'-15' Cut	560	L.F.	$ 95.00	$ [illegible]
42" R.C.P. in Pavement, 15'-20' Cut	1,840	L.F.	116.00	213,440.00
42" R.C.P. in Pavement, 20'-25' Cut	[illegible]	L.F.	144.00	[illegible]
42" R.C.P. in Pavement, 25'-30' Cut	520	L.F.	186.00	[illegible]
42" R.C.P. in Pavement, 30'-35' Cut	200	L.F.	227.00	45,400.00
42" R.C.P. in Pavement, 35'-40' Cut	400	L.F.	258.00	[illegible]
42" R.C.P. Outside Pavement, 0'-8' Cut	[illegible]	L.F.	60.00	[illegible]
42" R.C.P. Outside Pavement, 8'-15' Cut	[illegible]	L.F.	[illegible]	[illegible]
42" R.C.P. Outside Pavement, 15'-20' Cut	[illegible]	L.F.	[illegible]	[illegible]
Sewer in Tunnel	[illegible]	L.F.	[illegible]	[illegible]
Precast Concrete Manhole, Type I Base, 0'-8' Depth	1	Ea.	1,900.00	1,900.00
Precast Concrete Manhole, Type I Base, 8'-15' Depth	3	Ea.	2,150.00	6,450.00
Precast Concrete Manhole, Type I Base, 15'-20' Depth	15	Ea.	2,600.00	[illegible]
Precast Concrete Manhole, Type I Base, 20'-25' Depth	1	Ea.	[illegible]	[illegible]
Precast Concrete Manhole, Type I Base, 25'-30' Depth	2	Ea.	3,500.00	7,000.00
Precast Concrete Manhole, Type I Base, 35'-40' Depth	1	Ea.	4,200.00	4,200.00
Precast Concrete Manhole, Type II Base, 8'-15' Depth	2	Ea.	3,000.00	6,000.00
Precast Concrete Manhole, Type II Base, 15'-20' Depth	5	Ea.	3,700.00	18,500.00
Granular Backfill	25,000	C.Y.	8.00	200,000.00
Pavement Replacement, Type "C"	13,500	S.Y.	9.00	121,500.00
Rock Excavation	18,000	C.Y.	14.00	252,000.00

ESTIMATED CONSTRUCTION COST = $2,768,440.00

#6

[illegible]
[illegible]
[illegible]
[illegible], Ohio [illegible]

March [illegible], 1976

U.S. Environmental Protection Agency
[illegible]
Chicago, Illinois

Dear Sir:

I am opposed to the construction of a sewage treatment plant at the proposed site on the Olentangy River floodplain, opposite Highbanks Metropolitan Park, in Franklin County. Not only would the plant detract from the scenic beauty of the park, but more importantly, it would eliminate the unique flora and fauna of the river at that point.

As an alternative, I am a proponent of improving the sewage treatment plant at Jackson Pike.

CARA

March 10, 1976

Dear Mr Hut,

We the residents of Clintonville in Columbus, Ohio, numbering approximately 50,000 Voters and many children, wish to protest the building of the southern Delaware Sewage Treatment Plant on our Olentangy River.

We are certain there are other alternatives to solve this problem not involving the murder of all life forms in our beautiful river.

We do not want our money to be used for the benefit of a handful of developers at the expense of many thousands of people who enjoy the Olentangy River in its present condition.

Sincerely,
Lee [illegible]
[illegible]

I am against the Delaware Sewage plant being placed across the river from Highbanks [illegible] because it [illegible] that federal tax money [illegible] current developments. The [illegible] of the endangered species [illegible] just in the past [illegible] of the [illegible] and which stage [illegible] Highbanks which [illegible] from the [illegible] of the [illegible] should be used. One other site should be used that would take care of all Delaware [illegible] sewage problems and not be just as [illegible] as [illegible] Delaware Co. developed.

[illegible] Ruth Clark
1271 [illegible]
Columbus Oh
43224

#9

National Office
1800 North Kent Street, Suite 800
Arlington, Virginia 22209

OHIO CHAPTER
[illegible]
[illegible]
[illegible]

[illegible]

Statement to the U.S. [illegible] [illegible] [illegible] [illegible] Public Hearing Regarding the [illegible] Environmental Control Center

The Ohio Chapter of The Nature Conservancy is a conservation organization which specializes in the protection of areas which are in a natural, state, or near [illegible] conducive for the [illegible] [illegible] of all humans and fellow creatures. I [illegible] [illegible] [illegible] [illegible] of the Ohio Chapter, notably in January 1974 regarding the [illegible] Environmental Control Center. I feel that it is necessary that I continue comments in the capacity as an executive of that organization.

The forces at work that have caused the controversy over the necessity of, and/or, location of the [illegible] Environmental Control Center and the resultant Environmental Impact Statement resemble the very important concerns of our organization in its efforts to help maintain the quality of life for all generations of humans by protecting the aesthetic heritage and wealth of biological elements that are [illegible] [illegible] [illegible] realized by mankind and a responsibility to [illegible] [illegible] [illegible] with mankind.

I am most discouraged to feel that I have to testify at this time on an environmental impact statement which after [illegible] [illegible] [illegible] my final [illegible] shows that people are [illegible] [illegible] [illegible]. The EIS appears to attempt to [illegible] [illegible] [illegible] [illegible] difficult and complex long term problems which are not being [illegible] [illegible] [illegible] [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

#10

Mar. 16

I am against the Delaware Sewage Plant being Considered across from Highbanks in Delaware. I feel it has not been planned properly & will have a damaging environmental impact.

Martha Murphy
2381 [illegible]
Cols O 43229

#11

I am against the Delaware Sewage Plant being considered across from Highbanks in Delaware County.

Gail [illegible]
2093 [illegible]
Columbus, Ohio 43207

#12

There are a variety of reasons why Delaware County's proposed sewage treatment plant should be placed elsewhere:

1) the section of river into which the effluent would be discharged has been designated a scenic river (Scenic River Act, 1972)
2) the unique flora fauna of this section of the river is only possible under the present conditions.
3) effluent from the plant would ruin this distinguished biota and scenic Olentangy, similar to all of our other industrialized rivers — waterways for pollutants, not pleasure
4) this effluent, flowing downstream, as rivers do "will affect" residents of Franklin County.
5) Smell from the plant may be carried upwind into the park and result in many dissatisfied picnicers and taxpayers!

6) The aesthetic value, a commodity that can not be submitted to a benefit/cost analysis, would also be ruined during the majority of the year when foliage is lacking.

Connie Schneider
411 B E 14th
Columbus, Ohio

Valerie [illegible]
1299 [illegible]
Columbus, Ohio

#13

MARCH 16, 1976

I am opposed to the site just north of the Franklin-Delaware County Line, along the Olentangy River as a possible location for a sewage treatment plant. I am opposed to this proposed site for the following reasons:

1. It is located across from Highbanks Metropolitan Park -- in fact, directly across from the designated acre nature preserve. The view from the "overlook" atop the 110 foot cliff is unsurpassed in Delaware County as far as scenic beauty is concerned, and the location of a sewage treatment plant across from it would ruin its aesthetic appeal and its purpose for being there.

2. The parks in general, and the above-mentioned area included are visited by thousands of people each year, and for many, these visits are their only chance to see the unspoiled natural beauty that is left in central Ohio.

3. The part of the Olentangy River which runs by the proposed site is designated as a scenic river and has the richest fish population of the entire river; this would be destroyed if the sewage treatment plant was built there.

4. Building the plant there would definitely not enhance the beauty of the park or the river; it would not only detract from the scenic beauty and be responsible for the destruction of wildlife, but it would completely nullify a park visitor's experience.

5. The sewage treatment plant could not be "hidden" from view, as some people have said.

6. It (the sewage treatment plant) does not have to be located at this site. There are other sites available and other possible solutions to the sewage treatment problem.

Sincerely, A Concerned Citizen and Taxpayer,

Connie Lynn Chambers

Connie Lynn Chambers

#14

March 16, 1976

To be entered in hearing record of draft environmental impact statement on proposed sewage treatment plant on the Olentangy River in southern Delaware County:

We are opposed to sewage effluent being discharged into the Olentangy River. We are opposed to the siting of any sewage facility in the vicinity of Highbanks Metropolitan Park.

Siting a plant near the park would have the following effects:

(1) **Esthetic damage** - the plant would be visible from the highbanks overlook.

(2) Possible noise pollution by the plant's operations in the park environs.

(3) Potential odor problems.

Discharge of effluent near the park would:

(1) Create a visual and esthetic problem.

(2) Create a potential odor problem.

Discharge of effluent anywhere in the Olentangy would:

(1) Cause a risk to three endangered shellfish that inhabit the river.

(2) Have the potential, during low flow periods, of rendering the river sterile due to high concentrations of chlorine and ammonia. This loss of life would be irreversible in the case of shellfish and long lasting in the case of other aquatic life.

(3) Have deleterious effects on sport fishing in the river.

(4) Cause odors and damage to esthetics in the Worthington and North Columbus areas.

We suggest the following actions:

(1) No plant be built upon the river.

(2) All future sewage hookups be into Columbus interceptors and sent to the Jackson Pike facility. User fees for this service should be used to upgrade the Jackson plant to accept this new load.

(3) If the first two are unfeasible, the third and last option should be the upgrading of the Delaware treatment facility so that no sewage would go into the Olentangy with chlorine and ammonia in it. This would necessitate tertiary treatment.

Respectfully,

Steven C. McCaw Paula K. McCaw

Steven C. McCaw and Paula K. McCaw
163 E. Stafford Ave.
Worthington, Ohio 43085

#15

HEALTH DEPARTMENT
Delaware City and County
DELAWARE, OHIO 43015

LLOYD P. MAY, M. D.
Health Commissioner

115 North Sandusky Street
Phone 363-4961

Ladies and gentlemen

I am health commissioner of Delaware City and County. I was born in the hills of Kentucky and raised in the wide open spaces of Wyoming.

I love natural unspoiled country, watching birds and animals, listening to the sounds of nature - nothing is more pleasing or relaxing.

I don't want to see the environment spoiled and I do want to see healthy environmental conditions provided for our people.

These two ideas are basically compatible with a certain degree of understanding. Just as nature without man has its checks and balances, environment with man must have its checks and balances. Man has the big advantage of being able to think and reason and control his environment.

I have been in Delaware for 15 years and I've seen the county grow by leaps and bounds. Outside of the city of Delaware and the Village of Sunbury this growth has happened utilizing individual sewage treatment. We would have liked to have had central sewage for the southern portion of Delaware County many years ago for this is where much of the growth has been. However, economics and other factors prevented this and growth continued to roll on and problems continued to crop up.

We're not going to be able to stop future growth but finally seem to be to the point where we can provide central sewage treatment. Delaware County soils do not for the most part support on lot sewage treatment. It ought

(Page 2)

HEALTH DEPARTMENT
Delaware City and County
DELAWARE, OHIO 43015

LLOYD P. MAY, M. D.
Health Commissioner

115 North Sandusky Street
Phone 363-4961

this Delaware County has probably the most stringent individual sewage regulations in the state of Ohio but with it we are not providing for prudent economical land use. With the soaring prices of land and building costs pressures for change will be growing.

Delaware County is a major source of water supply for Metropolitan Columbus. We want to protect that water supply. We want to do and at the same time provide healthful living conditions for the present and future residents of Delaware County. When we reach the saturation point for individual sewage disposal systems both of these objectives will have been breached and possibly past the point of no practical return.

Further delay in the start of central sewage for southern Delaware County seems to be contrary to the interest of a million plus people.

We must make our decision in light of the importance of these people. This can only mean approval of the proposed central system now. All efforts have been made to minimize undesirable environmental effects. The remaining possible effects are infinitesimal in comparison to the advantages the system will provide.

What we really are facing in the way of environmental impact is the impact of not providing this sewage treatment now. Continuing to vacillate can only ensure multiplication of such sewage disposal and water supply problems.

An environment sensitive to adequate control of

(PAGE 3)

HEALTH DEPARTMENT
Delaware City and County
DELAWARE, OHIO 43015

LLOYD P. MAY, M. D.
Health Commissioner

115 North Sandusky Street
Phone 363-4961

The story is told of an aeronautical engineer who being just out of engineering school luckily received the chance to design a new small fighter plane. In his enthusiasm to make the plane super safe he built in margins of safety plus in all his calculations.

Eventually the big day came when the plane was rolled out for its first flight. It was then discovered that as the result of beefing up all his structures there was not a pilot small enough and light enough to get the plane off the ground.

Can we afford to sit on the ground while we should be flying and on our way!

Let's get moving and get this project off the ground.

Lloyd P. May, M.D.

#16-a

BASIC DESIGN ASSOCIATES
Consulting Engineers
250 NORTH STATE STREET
WESTERVILLE, OHIO 43081
614-891-0508

March 9, 1976

United States Environmental Protection Agency
Regional Administrator
Region V
230 South Dearborn
Chicago, IL 60604

Re: Olentangy Environmental Control
Center and Interceptor System,
Delaware County, Ohio

Dear Sir:

We are in receipt of the Draft Environmental Impact Statement of January 1976; we have reviewed the document and would like to offer some comments:

1. The discussion on page 5-3 states that phasing out septic systems creates a long term adverse impact. We do not agree. In this area, this will be a beneficial impact, as for many years the existing septic systems (Ref: Parkmoor estates) have surcharged the ground water table to the point that certain ground surfaces do not become stable even in dry weather, and are a source of continuing pollution of all waterways in the area.

As this area is now served by the Delco Water Company, whose source of supply is the Olentangy River, returning treated wastewater to the river via sewers will become more beneficial in the future, as well as provide low flow augmentation.

2. As engineers and as residents of the area, we question the size and cost of such a proposal as a discharge sewer for 15,000 feet to below the Outerbelt (p.4-24 and 5-8). The area through which such an outfall sewer would pass is already congested with other utilities; almost certainly either much private Right of Way would be needed, or extensive relocations of other facilities would be necessary. From what information is available in the Draft Statement, we cannot agree that such a project is feasible, or necessary, both from an environmental and economic standpoint.

3. Our firm is involved with similar environmental projects. Should our project ever reach a $15,000,000 price to service an intial 450 to 500 customers, the economics of particular areas with which we are working would not permit construction as not enough financing could be obtained for the clients' 25% share. Even though we realize the economic base of Delaware is sound, and the economic future of this area is a positive one, we cannot help but wonder if other assistance should be forthcoming to Delaware County besides United States Environmental Protection Agency due to the extremely complex nature of the problem.

A great deal of on site beautification has become part of the project due to the proximity of Highbanks Park; and an agreement exists between the Park and Delaware County for Park access to the Plant site. We suggest all beautification, including for structures, landscaping, etc. should be 100% Park expense.

The Olentangy River is designated as a Natural River by the Ohio Department of Natural Resources at this close proximity to Metropolitan Columbus. This is an extenuating factor not usually found upstram from large metropolitan areas. If it is decided that there should be additional treatment for ammonia and chlorine removal, or a longer outfall sewer, this additional work should be at 100% expense of the Bureau of Outdoor Recreation, the Fish and Wildlife Division of the Department of Interior, or other commenting agencies requesting additional treatment; after all, the Natural River segment is in danger if the plant is not built.

The real need for this project has actually been established by those who are against it or some phase of it; or who believe the level of treatment is inadequate. The total secondary and teritary impacts of their discussions, concerns, and actions reveal and emphasize what will happen to this area if this system is not constructed; that the natural environment will be subject to accelerating and continuing degradation by less thoroughly treated sanitary wastes from many sources, whereas the construction of this system and facility places an effective, regulated control upon the treatment and disposal of sanitary wastes for the entire area.

Yours very truly,
BASIC DESIGN ASSOCIATES

Lovell M Parsons
Lovell M. Parsons, P.E.

Patrick E Blayney
Patrick E. Blayney, P.E.

gls

cc: Congressman Samuel Devine
County Commissioners
Fred Stults, County Engineer

#16-b

BASIC DESIGN ASSOCIATES
Consulting Engineers
250 NORTH STATE STREET
WESTERVILLE, OHIO 43081
614-891-0506

March 9, 1976

United States Environmental Protection Agency
Regional Administrator
Region V
230 South Dearborn
Chicago, IL 60604

Re: Olentangy Environmental Control
Center and Interceptor System,
Delaware County, Ohio

Dear Sir:

Our firm, Basic Design Associates, represents the Village of Powell, Ohio, as Consulting Engineers.

We have noted that the Draft Environmental Impact Statement suggested that Powell be included in the first phase of the project.

This would be difficult to accomplish at this stage and would undoubtedly lead to further delays in the construction of this project.

We recommend that a separate project be started immediately with the filing of Step II Application by the Village of Powell to design the necessary sewers for service in Powell, as well as necessary interceptor sewers within the County.

Yours very truly,
BASIC DESIGN ASSOCIATES

Lovell M. Parsons
Lovell M. Parsons, P.E.

gls

cc: Mayor Mason

#17

FAHEY & SCHRAFF
ATTORNEYS AT LAW
570 SOUTH FIFTH STREET
COLUMBUS, OHIO 43215

(614) 221-8704

RICHARD P. FAHEY
CHRISTOPHER R. SCHRAFF

March 18, 1976

United States Environmental
Protection Agency
Region V
230 South Dearborn Street
Chicago, Illinois 60604

Attn: Harlan D. Hirt, Chief
Planning Branch - EIS Preparation Section

Re: Project No. C390698

Gentlemen:

These comments are directed to the Draft EIS prepared by your office for the Olentangy Environmental Control Center and Interceptor System. While I share many of the concerns expressed at the March 15, 1976, public hearing on the Draft regarding the adverse impact of the proposed plant on the Olentangy River, I will confine my remarks to the EIS's treatment of regional alternatives.

The National Environmental Policy Act of 1969, in Section 102 (iii) requires that an EIS contain a detailed statement of the alternatives to the proposed action. On page 4-6 of the EIS, it is stated that "the regional alternatives involving Delaware County and Columbus would be the most promising alternative on the basis of cost." This alternative is rejected, however, on page 4-7 because "extensive legal, economic, and institutional arrangements would have to be made to implement this alternative."

On pages 3-99 through 3-101, a cursory overview is provided of the possibility of creating a Conservancy District to operate a regional plan, and that alternative is rejected. I believe the EIS should more fully review the alternative administrative vehicles available under Ohio law for operating a regional sewer system. I do not understand how the EIS can make the conclusion on page 4-7, cited above, without a detailed statement of the alternatives.

Under Ohio law, at least three alternatives are available for administering a regional sewer system. Contrary to the implications on page 3-99, all can be created to serve multi-county areas. While the first alternative, a Regional Water and Sewer District, requires the participation of local governments for its creation (O.R.C. § 6119.02) the other two alternatives do not.

A Conservancy District can be created by the filing of petitions by private citizens (O.R.C. § 6115.05) as can a Sanitary District (O.R.C. § 6115.05). I would tend to agree with the draft EIS that a Conservancy District is not as appropriate as the other two alternatives for administering a regional sewer system. However, the draft EIS has no discussion of those two alternatives.

I sincerely wonder how Federal funds, appropriated under the Federal Water Pollution Control Act Amendments of 1971 can be expended on the alternative selected in the draft EIS without a thorough explanation of regional alternatives. Section 101(a)(5) of that Act declares Congress's preference for regional solutions to water pollution, and Section 201 carries that policy over into the funding provisions of the Act. Indeed, there is a serious question as to how the Delaware project has received such a high position in the OEPA's funding priority list when it does not propose to resolve a water pollution problem on a regional basis.

#18

United States Environmental
Protection Agency
Page Three
March 18, 1976

I do agree that there is a problem in Delaware County created by poorly treated sewage, but the alternative solution selected in the draft EIS seems inadequate in light of the overall problem in the Central Ohio Region. Sending partially treated sewage into a stream which is ill equipped to assimilate it, in a heavily populated area, seems a poor choice, especially when viewed in terms of the long run impact on the Central Ohio Region.

Very truly yours,

FAHEY & SCHRAFF

By: Richard P. Fahey

RPF:gs

COUNCIL · MANAGER · GOVERNMENT

CITY OF
WORTHINGTON
FOUNDED IN 1803

Office of
The City Manager

March 18, 1976

Harlan D. Hirt, Chief, Planning Branch
United States Environmental Protection Agency
Region V
230 South Dearborn Street
Chicago, Illinois 60604

Dear Mr. Hirt:

Enclosed is a copy of a statement from the City of Worthington registering objection to the alternative for the effluent pipe as proposed in the preliminary environmental impact statement. This is the same statement that was presented at the public hearing held on Tuesday, March 16, 1976.

Thank you.

Very truly yours,

James L. Brimeyer
James L. Brimeyer
City Manager

Enclosure

dg&

789 HIGH STREET · WORTHINGTON, OHIO 43085 · · · · · PHONE 885-4443

#19

Delaware Soil and Water Conservation District

29 Grandview Avenue - Delaware, Ohio 43015 - Telephone: 362-4011

March 19, 1976

Mr. Harlan D. Hirt, Chief
Regional V Planning Branch
United States Environmental Protection Agency
230 South Dearborn Street
Chicago, Illinois 60604

Dear Mr. Hirt:

This Soil and Water Conservation District has had a program for the protection and improvement of the soil and water resources of this District since 1944.

We initiated the request to have the U.S. Department of Agriculture, Soil Conservation Service, identify, map and publish a soil survey. The survey published in 1969 evaluates the soils for various uses including on-site-sewage disposal. Because of the slow permeability of about 97% of the soils, they are rated severe for sewage disposal. In our experience this has been a serious problem for many property owners. Our technicians receive many requests for a further evaluation of the soils to determine if improvements for sewage disposal are possible.

We have reviewed the environmental impact statement for the Olentangy Environmental Control Center and Interceptor System at the regular meeting of the Board of Supervisors of this District March 16, 1976, and made the following resolution:

WHEREAS, the Delaware Soil and Water Conservation District has played a significant role in developing practical and reasonable methods to improve the soil and water resources, and

WHEREAS, the District strives to serve all the people of Delaware County.

NOW THEREFORE BE IT RESOLVED, that we urged the United States Environmental Protection Agency to approve the Olentangy Environmental Control Center and Interceptor System as planned.

Sincerely,

James D. Ufferman
James D. Ufferman, Chairman

James Burkhart
James Burkhart

David A. Mussard
David A. Mussard

Forrest Hale
Forrest Hale

Lawrence Colflesh
Lawrence Colflesh

#20

March 19, 1976

U. S. Environmental Protection Agency, Region 5
230 South Dearborn
Chicago, Illinois 60604

Attention: Mr. Harlan D. Hirt

Dear Mr. Hirt:

I am writing you to express my concern over the proposed placing of a sewage treatment plant across from the Highbanks metropolitan Park Area.

As you should be aware, the Olentangy River is a favorite fishing spot for countless anglers. During the past few years, fishing interest has increased greatly, especially to those who are unable to leave the state and go to visit more attractive areas. This is probably one of the few remaining streams in Ohio, especially the Central Ohio area, that abounds in smallmouth bass. I hope much research has been done on the river to see what we can do to prolong the life of it. After meetings with the Army Corps of Engineers, some progress has been made to control the flow of water to better the spawning beds.

Now, once again a problem comes up that concerns the outcry known about the life of the river. We cannot see how the proposed sewage treatment plant could do anything but bring a negative effect to the vegetation and animal life which is the sustenance of all life support systems. Surely there must be another way to alleviate the sewage problem other than placing a treatment plant which would discharge itself into the river. Also, I would like to point out that the area proposed is probably one of the most beautiful areas along the stretch from Delaware to Columbus. This also is of great concern to not only fishermen but to all peoples who enjoy the beauty of the nature that we have remaining in this area. I, as well as many persons, have enjoyed for years the beauty which Highbanks affords us, in our own back yard so to speak.

To sum up what I have just written, I have to express to you that I am against not only the danger this sewage treatment plant my cause to the river, but also the detrimental effect it could have on the Highbanks Metropolitan Park Area.

Yours truly,

James Thompson
770 Mulberry Dr.
Worthington, Ohio

JT:jt

#21

TurnerAssociatesInc

1102 Motorists Building/471 East Broad Street/Columbus, Ohio/43215/Phone 614/228-8380

March 18, 1976

Mr. Harlan Hirt
Chief of Planning Board, Region V
Environmental Protection Agency
230 S. Dearborn Rd.
Chicago, IL 60604

Dear Sir:

I am writing to you as President of the Northwest Area Civic Association in Worthington, Ohio. It is my understanding that you held hearings yesterday in Deleware on the proposed sewage treatment plant for that area.

The proposed point of distribution of the waste created by the plant, Longfellow Avenue in Worthington, lies directly within the boundaries of our Civic Association. Our Association, representing over 1,125 homeowners in the area, wishes to be on record as being firmly opposed to using our neighborhood as a dumping ground. The logic of terminating such a project in highly populated neighborhoods misses us.

Please consider this note as our formal concurrence with the testimony provided to you by Congressman Chalmers P. Wylie, 15th District of Ohio, on March 17, 1976. Our concerns are sincere, and as an Association wish to have them on record.

Your assistance in this matter is appreciated.

Sincerely,

James F. Turner
President

cc: Congressman Chalmers P. Wylie

#22

6439 Taggart Road
Delaware, Ohio 43015
March 19, 1976

To the Editor
Delaware Gazette
Delaware, Ohio 43015

In re: Southern Delaware County
Sewage Treatment Plant

Dear Editor:

I am very disappointed but not surprised at the one-sided coverage of the EPA impact statement by the Delaware Gazette.

Why is the question of whether or not the sewage treatment plant is approved being left to the U.S. EPA? Why don't the residents of Southern Delaware County have any say in the matter? (What took place was nothing more than a kangaroo court hearing). It doesn't matter what the people want, the U.S. EPA will do as they please.

There were some very fine arguments against the plant that were not even mentioned in the Delaware Gazette coverage. Vince James, chairman of the Liberty Township Trustees, gave an excellent and well-thought out presentation. Tom Nagle, a lawyer, who has been studying this situation for months and knows the faultsand who gave another excellent presentation was never mentioned. Instead, what we get is John Wolf on the front page of the Gazette holding "up a beaker of murky Olentangy River water [implying] that bacteria in the river will destroy any chlorine the treatment plant may discharge". Instead of making such a stupid statement as saying bacteria will kill chlorine (impossible!) he should have mentioned the fact there is a reaction between the polluted water and chlorine which can give rise to chlorinated hydrocarbons, cancer-causing materials which right now are causing problems in the drinking water of New Orleans.

We must be aware of the dangerous situation we are in with our already overpolluted rivers. Using rivers as a means of disposing waste is no longer the solution. The agency that encourages and approves a sewage treatment plant whose waste is discharged into the river is not an Environmental Protection Agency, but an Environmental Pollution Agency.

People say they are worried about the health of their children playing in ditches where there is raw sewage. It appears they are concerned about their children, but they don't give a damn about the health of anybody else downstream.

Delaware Gazette - page two

Another very important fact that was brought up is that Phase I of the sewage treatment plant is not going to cost $14 million but instead is going to cost $30 million (that is not including inflation and the interest on borrowed money) plus $400,000 per year for operation and maintenance costs. This information was confirmed by the consultant for the U.S. EPA. Why was there no mention made of this? Especially when one realizes it is the people of Delaware County that will be paying $30 million for this first phase.

How many homes actually are causing a health problem due to poor on site sewage treatment? How much would it cost to remedy this situation? And how many of these problem homes will be connected to the sewage treatment plant in Phase I?

As for newcomers and developers, let them bear the expense of workable on-site systems. As a citizen of Delaware County, I don't want to be taxed out of existence to line the pockets of John Wolf and his greedy developer friends.

Sincerely,

Natalie Yiamouyiannis

Natalie Yiamouyiannis
548-4067

cc: Harlan Hirt, Chief
Planning Branch U.S. EPA
Representative John Seiberling
Representative Sam Devine
Representative Chalmers Wylie
Senator Robert Taft
Senator John Glenn
Delaware County Commissioners

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#23-a

C
W | H WORTHINGTON HILLS CIVIC ASSOCIATION
A
WORTHINGTON, OHIO

March 22, 1976

Mr. Harlan D. Hirt, Chief
Planning Branch
United States Environmental Protection Agency, Region V
230 South Dearborn St.
Chicago, Illinois 60604

In Re: Proposed sewage treatment plant for
Southern Delaware County and its
effects on the people living in
Worthington Hills
Project #[illegible]

Dear Mr. Hirt:

As president of the Worthington Hills Civic Association, representing a community of [illegible] homes approximately one mile south of the proposed treatment plant, I would like to express our concerns about the proposed site of the Southern Delaware County Sewage Treatment Plant.

Reading through the Draft of the EPA statement on the Olentangy Environmental Control Center and Interceptor System, we find there is no mention of the wells from which our community draws its drinking water. These shallow wells are located under the Olentangy River about one mile south of proposed site OR-3. Because these wells are our sole supply of water, we are concerned that the quality of our water would be endangered by chemicals from a sewage treatment plant at the Delaware and Franklin County lines — especially from chlorinated hydrocarbons. "Researchers studying the New Orleans and Cincinnati water supplies found that chlorine, added to water to kill harmful bacteria, can combine with certain pollutants to form compounds that may cause cancer; cancer rates in the New Orleans area which draws its water from the lowermost part of the Mississippi are among the highest in the nation" - Time, Oct. [illegible], 1975, p. 67.

Our second concern is airborne pathogens. It is interesting to note that though the Draft spends considerable time reassuring readers that the airborne pathogens would not pose a serious health hazard to picnicers at Highbanks Park, it does not mention the effect it might have on densely settled Worthington Hills, which is about an equal distance from the OR-3 site.

Our third concern is odor. Stagnant air conditions are not infrequent in summer which would favor selection of a site which was farther away from densely settled areas. Our nearest homesites are less than one mile from the proposed site OR-3. Page 3-31 of the Draft states: "Effects on the immediate environment might include problems of odor, noise, and visual impacts. There are a number of residents that could be affected near both sites (OR-1 and OR-2). The Northern site (OR-2) however, has a high density population nearby in Worthington Hills and Mt. Air."

Our final concern is about the expected discharge from the plant, especially during low flow conditions. According to the Comprehensive Plan For Water &

WCHA WORTHINGTON HILLS CIVIC ASSOCIATION

WORTHINGTON, OHIO

Mr. Harlan D. Hirt, Chief
Planning Branch
United States Environmental Protection Agency, Region V

March 22, 1976
Page 2

Sewage Development, Delaware Co., Ohio 1969, by Finkbeiner, Pettis & Strout, 100 gallons per day is the figure used for average domestic use in the projection of sewage flows. Yet, according to the manager of our water treatment plant, the people of Worthington Hills have a normal consumption rate of 280 to 330 gallons per person per day. We feel that the Draft underestimates the outflow. We do not feel that the diluting capacity of the Olentangy River is sufficient to handle the toxic concentration of various chemicals which will be found in the effluent and which will have a significant detrimental effect on our water supply and ultimately our health.

We note that three other water sheds (p. 2-20 of the Draft) were not selected as a site for effluent disposal because they provide a public water supply. Does Worthington Hills not command the same consideration?

Sincerely yours,

WORTHINGTON HILLS CIVIC ASSOCIATION

Shirley A. Decker

Shirley A. Decker
President

SAD/p

cc: Ned Williams, Ohio EPA
Kenneth R. Reed, Delaware County Commissioner
Michael J. Dorrian, Franklin County Commissioner
Congressman Samuel Devine
U. S. Representative Chalmers Wylie
Valley Utility Company

#23-b

WCHA WORTHINGTON HILLS CIVIC ASSOCIATION

WORTHINGTON, OHIO
1367 Oakview Dr.

March 24, 1976

Mr. Harlan D. Hirt, Chief, Planning Branch
U.S. E. P. A., Region V
230 South Dearborn St.
Chicago, Illinois 60604

Re: Project #C390698

Dear Mr. Hirt:

In a letter to you dated March 22, 1976, in regard to the proposed sewage treatment plant for Southern Delaware Co. (project #C390698) I wrote: "Yet, according to the manager of our water treatment plant, the people of Worthington Hills have a normal consumption rate of 280 to 330 gallons per person per day."

After reading his copy of the letter to you, Mr. Hiniken, manager of the treatment plant called me. He said that 280 to 330 gallons was current usage per customer--not per person. Six month figures for spring & summer average 440 gallons per day. Figuring 4 persons per household, he came up with a 112 gallons per person per day figure. Fall and winter six month average is 326 gallons per customer.

These new figures on water usage do not change our orignial concern in regard to odors, noise, airborne pathogens, and chlorinated hydrocarbons. It does change the amount of water to be discharged from the treatment plant, but we feel it might still be a problem if the plant could only handle 100gallons per day per person.

Sincerely yours,

WORTHINGTON HILLS CIVIC ASSOCIATION

Shirley A. Decker

Shirley A. Decker
President

cc: Ned Williams, Ohio EPA
Kenneth R. Reed, Delaware County Commissioner
Michael J. Dorrian, Franklin County Commissioner
Congressman Samuel Devine
U.S. Representative Chalmers Whlie
Valley Utility Company

ENVIRONMENTAL PROTECTION AGENCY
RECEIVED
MAR
PLANNING

#24

Dear Sir;

After reading newspaper report and attending the meeting, I decided to express my feeling about the Delaware Sewer plant.

I am a home owner and from my kitchen window, can see the site selected for the Sewage plant. I am an outdoors person and spend many hours along Olentangy River. I can only report what I see, and not so called scientific facts, which can be changed to fit whichever side your on. I believed when the river was designated a scenic river, the Sewer plant could never happen. I wish you would check below, any sewage plant, and see what happens to the rivers. They become dead. A check of the records would show how many times the Olentangy was killed below Delaware sewer plant.

A check of records will show a long list of river kill of fish & wildlife every year over the State. Engineers guarantee means Nothing, unless its backed up. Any equipement will break down plus human error.

Anyone who lives along the river in August and Sept, in a dry year, will tell you the flow is very little. The noise and smell of the plant just opposite the metropolitan park is almost unbelievable. I heard, mention of the Worthington Hills plant, go and see the muck in river below this small plant, and you can see the future of river below any sewer plant. To top it all off a check will reveal the people who would benefit most are real Estate developers. I think the only real solution is for Columbus to take over the sewage problems. Columbus Sewage is moving into Delaware County in different places. Westerville, new development West of Scioto River.

Up to this time there is no completely sure sewage treatment. I must say this section ~~on~~ of river is the most beautiful of any of the State. A canoe trip down the river will let you see all types of wildlife almost unbelievable so close to a big city.

John Nesser

John Nesser
686 Plum Tree Dr.
Worthington, Ohio 43085

#25

Law Offices
Britt, Graf, Campbell & Nagel
Court House Square
5[illegible] South High Street
Columbus, Ohio 43215

JAMES C. BRITT, JR.
JACK R. GRAF, JR.
JOEL P. CAMPBELL
TOM H. NAGEL

TELEPHONE
AREA CODE 614
[illegible]

March 22, 1976

Mr. Harlan Hirt, Chief
Planning Branch
US EPA
Region 5
230 South Dearborn Street
Chicago, Illinois 60604

Re: Further comments on the draft EIS for the "Southern Delaware County Environmental Control Center"

Dear Mr. Hirt:

The following is submitted as additional comments on the EIS referred to above, following the public hearing on March 16, 1976.

At the public hearing there appeared to be considerable controversy over questions which should be concrete scientific fact. I request that all of these matters be resolved as finally as is reasonably possible by the final draft of the EIS. I refer specifically to questions of low flow, percentages of residual chlorine and ionized ammonia in the effluent after mixed in the river at low flow; water quality in the Olentangy during "normal" and "drought" years as well as 1973 and finally, the reliability of sewage treatment plants.

In regards to the question of STP malfunctions, I request that the final draft document, from the available literature, the general reliability and percent of down-time of conventional tertiary treatment sewage treatment plants generally. I further request that you look into the question of the reliability and percentage of down-time of STPs in the Central Ohio area; and the reliability and percentage of down-time of STPs designed by the consulting engineers in this matter, Burgess & Niple, Ltd. Finally, the impact of STP failures that could reasonably be expected within a 20 year planning period should be detailed and the impact should be evaluated.

In general, I would hope that the final draft of the EIS would attempt to assign values to and weigh the beneficial and adverse impacts of the proposed action and compare that with the advantages and disadvantages of a creative "no build" option and regionalization.

Respectfully submitted,

Tom H. Nagel

Tom H. Nagel

THN:dm

#26

2993 Neil Avenue
Columbus, Ohio, 43202
March 20, 1976

Mr. Harlan D. Wirt
Chief Planning Branch
USEPA, Region 5
230 South Dearborn
Chicago, Ill, 60604

Dear Sir:

I attended the evening hearings on Tuesday March 16, 1976 concerning the proposed sewage treatment plant in Delaware County, Ohio.

I am opposed to the site selected by the consulting engineers on the grounds that not enough consideration was given to the preservation of the designated scenic Clentangy River and to the damage that could be done to the stream itself.

That particular location would be especially detrimental to the overlook at Highbanks Metropolitan Park, which is the most outstanding feature of the Park. Likewise, the view from Route 315 over toward the Park would be ruined.

It seems we spend money at cross-purposes to develop scenic routes and parks and then ruin them with a plant such as the one proposed for sewage treatment. If indeed Delaware County does need the facility, and I would not argue that point, I trust another site or solution could be worked out.

Sincerely yours,
Martha Genheimer
Martha Genheimer

#27

Dear Sir 3-23-76

We would like to express our disappointment concerning the proposed sewer treatment plant north of Mt. Air Ohio.

This area of the Olentangy River is one of the most beautiful River scenery in the State.

Most important of all there are many species of fish that will most certainly be effected by a water treatment plant. A Major fish kill or any fish kill for that matter, would be an insult to wildlife and Preservation.

957 Sells
Columbus, Ohio
43212

Mr. & Mrs. K.F. Phelps

#28

The Delaware County Health Planning Council
of
The Mid-Ohio Health Planning Federation

POST OFFICE BOX 2289 COLUMBUS, OHIO 43216

Office
[illegible] EAST BROAD STREET
Telephone
[illegible]

March 22, 1976

Mr. Harlan Hirt, Chief
Planning Branch
U.S. Environmental Protection Agency
Region V
230 South Dearborn Street
Chicago, Illinois 60604

Dear Mr. Hirt:

The Delaware County Environmental Health Committee of the County Health Planning Council has reviewed the draft Environment Impact Statement for the Olentangy Environmental Control Center and Inceptor System and wishes to go on record as supporting the original county facility plan and its location.

Having consulted with Gary Gilbert, Assistant County Sanitary Engineer, there seems to be some conflicting data in the impact statement as compared to some of the County's data. We feel that it is important for these items to be clarified promptly so that the final grant can be awarded and so that construction can begin.

As a group, we are most interested in the environment and believe that the total quality of the environment should be protected and hope that the final decisions made will assure this.

Sincerely,

Laura Kloth

Laura Dees Kloth, Chairperson
Delaware County Environmental Health Committee

LDK/mdm
cc: Joseph Derek, County Representative
Delaware County Health Planning Council
Fred Stults, County Engineer

ENVIRONMENTAL PROTECTION AGENCY
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MAR 25 1975
PLANNING BRANCH - Region V

#29

Harlen D. Hirt
Chief, Planning Branch
US EPA, Region V
230 South Dearborn
Chicago, IL 6060-

Re: Olentangy Environmental
Control Center and
Intercepter System,
Delaware County, Ohio

Dear Mr. Hirt:

I attended the Public Hearing on the project on March 16, 1976 and listened to the arguments put forth by the opponents to the project as it is currently conceived.

I disagree with the suggestions that more studies should be made insofar as site location is concerned. The site by Highbanks Park offers the optimum combination of best service to the contemplated sewered area with the least environmental disruption. This is why the environmental impact statement was prepared. After all the natural environment to this area is already disrupted by the presence of the park with its thousands of visitors as reported at the hearing by park representatives.

I disagree with the argument that the project will promote growth. Growth will come whether the project exists or not; developers have been considering pacage treatment plants in their projections of this land use for some time; no one can successfully develop tracts by basing their plans on something that doesn't physically exist, such as a sewage collection and treatment faciliti

One point the opposition repeatedly mentioned was plant malfunctions by pointing to past poor performance by City of Columb Plants and the City of Delaware Plant. Everything included in this discussion applied to the older version of these facilities, prior to recent improvements and new construction.

The proposed Olentangy Environmental Control Center will be completely new, with the best available technology designed into it. Even though the chance of failure of some component exists, the failure of enough components to seriously affect the effluent quality is highly improbable.

The only item voiced by the opposition which I consider worthy of further consideration is concern for certain endangered aquatic species which are claimed to exist downstream of the proposed plant. Columbus, Worthington, and the Ohio Highway Department have presented enough arguments against the downstream discharge that this suggestion in the EIS can no longer be considered an alternate.

The solution to this problem involves the chemical (Chlorine and ammonia) tolerance levels of these aquatic species and low flow augmentation.

Since the issuance of the EIS in January, data has been made available to the United States Environmental Protection Agency by the Ohio Environmental Protection Agency, to show that the amounts of chlorine and ammonia discharged by the plant will be diluted below harmful levels to this particular aquatic life.

I consider this last problem to be resolved, and look forward to seeing this project implemented in the near future.

Yours very truly,

Patrick E. Blayney

Patrick E. Blayney, P.E.
7365 Monica Court
Westerville, OH 43081

gls

cc: Delaware County Commissioner
Fred Stults, County Engineer

#30

LEAGUE of WOMEN VOTERS
96 West William
[redacted] Street
Delaware, Ohio 43015

TESTIMONY ON THE OLENTANGY ENVIRONMENTAL CONTROL CENTER
Prepared by the Delaware League of Women Voters

After study of the draft Environmental Impact Statement and listening to testimony given at the public hearing, March 16, the Delaware League of Women Voters wishes to go on record as favoring the facilities plan.

We feel that there is really no practical alternative to the location proposed across from Highbanks Metropolitan Park. The design of the plant will not be detrimental to the park or to nearby residential areas. It is, however, important that the standards proposed for noise, odor, and water quality be met and maintained.

We agree that Columbus residents have a right to be concerned about the quality of water coming into their area. The aquatic life of the river is also important and must be preserved. We are satisfied that every effort is being made to achieve a safe level of discharge. Monitoring by the Ohio EPA should assure good water quality. There is no need to locate the outfall pipe downstream below Interstate 270.

We understand the concern of some Delaware County residents that the plant will not immediately relieve some problem areas and that it will cause more development in the southern part of the county. Development will occur in any case and package plants will be used if a central system is not built, thus compounding an already serious sewage problem. Completing the proposed plant as soon as possible is the first step in servicing all areas. Hopefully additional financing will be sought to speed completion of the planned phases. As Delaware County residents we can continue to encourage this action.

Melva Hunter

Melva Hunter
President

Stephanie Cannon

Stephanie Cannon
Land Use Chairman

#31

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
REGION V
300 SOUTH WACKER DRIVE
CHICAGO, ILLINOIS 60606

OFFICE OF
THE REGIONAL DIRECTOR

March 25, 1976

Mr. Francis T. Mayo
Regional Administrator
Environmental Protection Agency
230 South Dearborn Street
Chicago, Illinois 60604

Dear Mr. Mayo:

RE: Draft Environmental Impact Statement
Olentangy Environmental Control Center and Interceptor System
Delaware County, Ohio

We have reviewed the Draft Environmental Impact Statement for the above project. To our knowledge, and based upon the information provided, this project will not impact to any significant degree on the health, education or welfare of the population.

Sincerely,

Robert A. Ford
Robert A. Ford
Regional Environmental Officer

cc: Charles Custard, OEA
Warren Muir, CEQ

RECEIVED
MAR 26 1976
OFFICE OF DIRECTOR
S&A Division, EPA, Region V

#32

ENVIRO CONTROL, INC.

One Central Plaza
11300 Rockville Pike
Rockville, Maryland 20852
Telephone 301-468-2500

March 24, 1976

Ms. Catherine Grissom
U.S. Environmental Protection Agency
Region V
230 South Dearborn Street
Chicago, Illinois 60604

Dear Cathy:

I enjoyed meeting with you, Gene Wojcik, Harlan Hirt, and Gary Schenzel. The hearing was quite enlightening in several respects. As I promised in our telephone conversation, I have collected here my impressions and recommendations for revision of the Draft EIS.

Costs

The aspect I find most critical and least well covered is the specific cost per household for the entire operating system, including individual hookups, sewers, interceptors, plant effluent and sludge disposal, operation and maintenance, and debt service. I have a feeling that if the true, unsubsidized costs of this project to both local and national taxpayers were fully realized, even its most ardent advocates would have second thoughts. I have seen so many of these projects gaining approval on the basis of woefully inadequate cost information only to have people curse their decision and all who were involved for many years to come. I believe that EPA has a strict obligation under Section 212 (2) (B) of PL 92-500 to make sure that all pertinent cost facts are laid out fairly and accurately, before approving Step 2 funding.

The Final EIS should spell out clearly the capital and O&M costs of each phase in terms of both present worth and annual equivalent amount. These figures should include and break out the costs of the plant, effluent and sludge disposal, interceptors, sewers, hookups, and any other costs required to make the system fully operational.

The assumptions underlying the basic cost estimate should be stated and incremental costs for each reasonable option should be provided. These options should include two discount rates (6 1/8% and a reasonable, applicable free market rate), three planning periods (20, 30, 40 yrs.), and addition of the various mitigative measures, such as landscaping of plant site, odor and noise control, extended outfall, chlorine and ammonia removal.

The Final EIS should spell out how many households in each locality would be serviced by each phase of the project, when service would commence, and how much future service capacity would be provided for each locality. The secondary impact of interceptor construction on population growth and distribution pattern should be discussed more fully.

Alternatives

The flow reduction and wastewater reuse alternatives deserve a much more thorough treatment than they received in the Draft EIS. For example, what would be the impact of flow reduction on overflowing septic tanks and on some of the regional alternatives, which are stymied by existing interceptor and plant capacity constraints? What are the prospects of reusing partially treated grey water (bath and laundry wastewater) for flushing toilets or irrigation of local parks and pastures?

Under the treatment process and no action alternatives, the Final EIS should also provide a more thorough discussion of the feasibility of local treatment by package plants, aerobic units, evapotranspiration units, and other advanced systems, with the provision of a regular, enforced maintenance organization sanctioned by the county. The major advantages of local treatment include elimination of the cost and impact of sewers, sewage treatment plant, and effluent and sludge disposal, as well as flexible service phasing, preservation of future development planning options, opportunities for local effluent reuse, slight consequences of an individual malfunction, and avoidance of most jurisdictional entanglements.

I would readily admit that we have not made a good case for eliminating the Delaware County/Columbus regional alternative, particularly Subalternative 5. For example, we have not explored the impact of water conservation on constraints imposed by Franklin County interceptors, the cost of eliminating the "bottleneck" in downtown Columbus, nor the difficulty of concluding the necessary institutional and financial arrangements. An interesting point brought out at the hearing was that Delaware County peak sewage flow would be reaching the Columbus plant several hours after the Columbus peak flow, thus reducing the need for expansion of the plant's capacity.

Water Quality

The amount and timeliness of the water quality data we reported are admittedly less than adequate, inasmuch as we had to rely on existing information. However, if the detailed concentrations of the various pollutants become a major issue, then a better attempt should be made to assess

the specific point and non-point sources of these pollutants. In this manner, the desirable concentrations can be attained in a cost-effective manner by attempting control of the most offensive sources.

I don't feel qualified to pass on the biologically desirable levels of residual chlorine and ammonia, but this is obviously an issue that is on many people's minds and needs to be considered further. Inasmuch as removal of these compounds from plant effluent involves readily controllable physical-chemical processes, would it not be possible to adjust extent of removal in accordance with changing flow conditions?

The low flow figure reported in the Draft EIS should be reassessed in light of the recent hydrologic modifications of the river and the controllability of releases from upstream reservoirs. The low flow here will be governed less by accident of nature than by reservoir holding capacity and the success of release strategy.

I hope that these comments will be helpful to you in the preparation of the Final EIS. Please feel free to call, if you wish to discuss these or any other items.

Sincere regards,

ENVIRO CONTROL, INC.

Alex H.

Alex Hershaft, Ph.D.
Director of Environmental Studies

AH:ac

#33

W. F. Millhon Medical Clinic, Inc.
Whetstone Medical Center
3730 Olentangy River Road, Columbus Ohio, 43214 · 614/451-3944

INTERNAL MEDICINE
[illegible]

NEUROLOGY & E.E.G.
[illegible]

GASTROENTEROLOGY & ENDOSCOPY
[illegible]

CARDIOLOGY
[illegible]

PULMONARY DISEASE & ENDOSCOPY
[illegible]

ENDOCRINOLOGY & METABOLISM
[illegible]

RADIOLOGY
[illegible]

March 19, 1976

Harlan D. Hirt
Region 5 Planning Branch
230 South Dearborn Street
Chicago, Illinois 60604

Dear Mr. Hirt:

In regard to the proposed sewage disposal plant in the Olentangy basin for the city and township of Delaware, I have seen your environmental impact.

"Air quality is not anticipated to be a problem, but will be dealt with in greater detail in the final EIS. Airborne pathogens will not present a significant health hazard." This is in direct contradiction of a recent extensive and thoroughly documented article by Drs. Pereira and Benjaminson published in the official public health reports for May and June, 1975, Volume 90, #3 p. 208-212. This article is supported by an extensive bibliography and is in direct contradiction to the statment that airborne pathogens will not present a significant health hazard.

I am enclosing a copy of this article and would call your attention to the summary. "Our results point to the existence of a possible health hazard, such as microbacterial disease, especially for sewage treatment plant workers and for highly susceptible population groups such as young children, the elderly and infirmed, who reside in areas where the atmosphere is contaminated by the gaseous effluent of sewage treatment plants." This is about as accurate description as would be possible for the age groups involved in the metropolitan park area, which is in the direct line of prevailing winds from the prospective plant.

It seems to me that rather than negating it with a minimal statement such as is included in the current statement, that this should be an extremely important factor. It certainly is an important factor from the standpoint of medicine, and I intend to bring this subject to the Columbus Academy of Medicine. I feel sure that this article was included in the original objections to it, and I am surprised that so little attention was paid to a recognized scientific investigation. There is no emotionalism tied in with this. This is straight medicine and represents the most direct type of environmental pollution.

I would sincerely hope that this study would assume a bit more importance in your final evaluation of this problem.

Very sincerely,

C. Joseph Cross

C. Joseph Cross, M.D., F.A.C.P.
Chairman, Department of Medicine
Riverside Hospital
Columbus, Ohio

CJC:mab

Enclosure

Broadcast of Microbial Aerosols by Stacks of Sewage Treatment Plants and Effects of Ozonation on Bacteria in the Gaseous Effluent

MARTIN RODRIGUES PEREIRA, PhD, and M. AARON BENJAMINSON, PhD

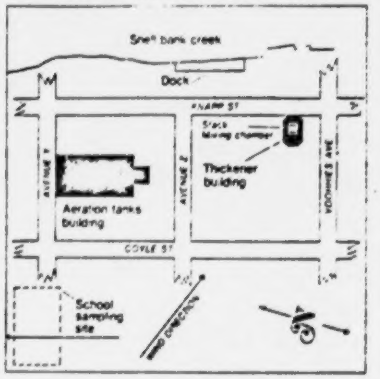
THE PURPOSE of the investigation was to demonstrate that microbial pollution of the air by sewage treatment plants is an environmental factor which deserves more intensive study. The data derived from this study should be taken into account in planning and locating sewage treatment plants, since these facilities are often constructed in or near residential areas.

Kenline (1), Adams and Spendlove (2), Goff and co-workers (3), and others have shown that microbial aerosols originating from sewage treatment installations do indeed contaminate the atmosphere downwind from these facilities. Coliform bacteria have been collected up to 1.2 km (0.8 miles) downwind from a sewage treatment plant's trickling filter system (2). Ledbetter and Randall (4,5) concluded, after studying the aerosolization of bacteria from an activated sludge unit, that the number of micro-organisms in the air after passage over the aeration basins increased markedly and persisted for a considerable time and distance. They found enteric pathogens, especially *Klebsiella*, in large numbers in these aerosols. Dixon and McCabe (6) listed the following micro-organisms that have been found in sewage: *Salmonella, Shigella, Leptospira, Mycobacterium tuberculosis, Ascaris lumbricoides, Entamoeba histolytica*, and Coxsackie, poliomyelitis, and infectious hepatitis viruses. Grinstein and co-workers (7) probed a stream receiving chlorinated effluent from a sewage treatment plant for virus contamination; virulent strains of poliomyelitis and ECHO viruses were shown to survive the chlorination process.

Woodcock (8) and Blanchard and Syzdek (9) demonstrated that the spreading of micro-organisms in air is produced by bubbles breaking at the air-water interface of a body of water, where some micro-organisms tend to concentrate. We hypothesized that virulent viruses surviving in chlorinated sewage effluent may be aerosolized, as are bacteria, by this water-to-air transfer mechanism. That viruses can be transported by air currents indoors and that at least some of them remain infectious is well documented. An example of this transfer under nonlaboratory conditions occurred in an outbreak of airborne smallpox in a West German hospital (10). Hemmes and co-workers (11), Mayhew and Hahon (12), and many other investigators have noted that the decay rate under various environmental conditions varies with the individual virus, that is, those conditions favorable to the survival of one virus may be detrimental to that of another and vice versa. Attempted studies of the effects of open air conditions on the infectivity of viruses by Benbough and Hood (13) and Berendt and Dorsey (14) have not yielded definitive results. In any case, as is pointed out by Zeterberg (15,16), there is a strong probability that bacteria and viruses act synergistically in the causation of respiratory disease; only one virus particle lodged in the proper niche of the respiratory tree is required for infection, viruses need not retain their infectivity to cause deleterious effects on hypersensitive persons.

The sewage treatment plant in our study is one of the few in New York City where odor control is being attempted by mixing ozone with the gaseous effluent. This process is applied only at the building housing the thickening tanks (see chart). In the future, this system of odor control is slated for application to all sewage treatment plants in New York City (oral statement by Norman Nash, deputy director of plants, Bureau of Water Pollution Control, Department of Water Resources of the City of New York). Since our resources were limited, our research was intended to be only a qualitative pilot study, and we have not attempted to draw quantitative conclusions.

Sites of aerosol studies of sewage treatment plant



Materials and Methods

Aerosol studies. We sampled the air in and around a New York City sewage treatment plant during the period from December 1970 to September 1971. Andersen samplers (17) were used to collect aerosols. The pumps of these samplers were calibrated to draw 0.028 cubic meters of air per minute (1 cubic foot per minute). The stages of the samplers were loaded with petri dishes containing either tryptic soy agar (TSA) or sheep blood agar (SBA), as we did not wish our collections to be subjected to an experimental bias (18).

The aeration building of the plant measures about 120 meters in length, 30 meters in width, and 15 meters in height. In the north wall of the building are eight fans, each one draws in 300 cubic meters of air per minute. At the southern end of the building are two identical exhaust stacks, each with a diameter of 1.62 meters and each with two fans in parallel; together they exhaust 2,100 cubic meters of air per minute (see chart). The effect of all the fans is to draw the air inside the building over the aeration tanks and force it up the stacks and out into the air.

Sampling the open air in the vicinity of the plant from December 1970 to January 1971 was done equidistantly (about 300 meters from the aeration building) upwind at a neighborhood school and downwind at dockside on Shell Bank Creek (see chart). These stations were probably not the best locations from a maximum aerosol coverage standpoint, but they were the most accessible.

The air inside the aeration building was sampled during December 1970 and January and March 1971. The internal atmosphere of one exhaust stack was sampled during March 1971. The number of samplings for each location is shown in table 1. Colonies for identification were chosen at random. Smears were made, gram-stained, observed microscopically, and identified as to morphology. They were then cultured in the appropriate differential media. Further identification was based on biochemical reactions in these media.

Table 1. Average counts of bacterial colony-forming units in the atmosphere of a sewage treatment plant

Sampling point	Number of samplings	Average number of colonies per cubic meter
300 meters upwind from aeration building	3	17
Inside aeration building	4	21,930
Inside stack of aeration building	3	890
300 meters downwind from aeration building	5	48

NOTE: Atmospheric conditions during sampling period were as follows: −10°C to 10°C temperature, wind velocity 2.2 to 22 meters per second, [illegible] direction, relative humidity of 30 to 90 percent. All sampling was done during daylight hours. The sky varied from clear to overcast.

Sewage liquor studies. Four liquid samples were taken at random from one aeration tank. These were subjected to routine bacteriological analysis for the identification of bacteria. The chance finding of acid-fast bacilli led to the following sampling procedure.

Stack lumen studies for acid-fast bacilli. Sterile swabs moistened with glycerine were inserted into the sampling port of the stack located about 6 meters above the roof of the aeration building, the top of the stack being about 9 meters above roof level and about 22 meters above ground level. Exact measurements of stack and building heights were not available to us; therefore, only estimates have been used. After being allowed to remain in the stack lumen for about 15 minutes, the swabs were digested with trisodium phosphate and the concentrate inoculated into tubes of Petragnani's medium and incubated at 37°C. These cultures were inspected periodically for suspicious colonies. Smears of these colonies were made and stained by the Ziehl-Neelsen technique. The growth from those cultures whose smears, upon microscopic inspection, showed acid-fast bacilli, was then scraped off the surface of the medium and emulsified in normal saline. Next, 0.2 ml of the suspension was injected intraperitoneally into four female guinea pigs which had been previously tuberculin tested and found negative. After 6 weeks, the animals were killed, and autopsies were performed. Their lungs, livers, and spleens were examined for gross lesions. Impression smears and histological sections of the organs were made, stained by the Ziehl-Neelsen technique, and examined microscopically.

Disinfecting properties of ozone intended for odor control. Although ozone is intended for odor control only,

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The research described in the paper was done under the auspices of the Department of Air Resources, City of New York.

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it was deemed propitious to test the disinfecting properties of this gas in air, as it is sometimes used to disinfect liquid effluents. The ability of ozone to disinfect the gaseous effluent of the building housing the thickening tanks (see chart) was tested in August and September 1971. Ozone generated inside this building is injected at various concentrations into the stack at the level of the twin, horizontally oriented exhaust fans. Andersen samplers loaded with either TSA or SBA, depending on the sampling run (tables 2 and 3) were placed on the floor of the stack's mixing chamber (see chart), this being the most practical location. Samples were taken under conditions of no ozone production, minimal (approximately 2.3 kg per day), and maximal (approximately 4.5 kg per day).

Table 2. Average counts of colony forming units (CFU) in a series of tests in the ozone mixing chamber, using sheep blood agar

Stages of Andersen sampler	Control—no ozone (CFU)	Minimal ozone (CFU)	Maximal ozone (CFU)
I	85	25	45
II	85	23	40
III	213	71	103
IV	213	107	205
V	175	61	97
VI	19	16	18
Totals	790	303	508

Results

The average numbers of colonies per cubic meter of air sampled inside and outside the sewage treatment plant are listed in table 1. The air inside the aeration building contained 21,800 viable bacterial colony forming units (CFU) per cubic meter. This number diminished to 890 in the stack of the building, but about 300 meters downwind from the aeration building, that quantity dropped to 48 CFU per cubic meter. At a similar distance upwind, the average count was 17 per cubic meter.

Table 4 lists the organisms identified in samples taken around the plant; the majority of corresponding particles were in the pulmonary retention range 2.0 − 5.5 μm (stages III and IV of the Andersen sampler). Those collected downwind included *Bacillus*, *Flavobacterium*, *Micrococcus*, *Streptococcus*, and *Klebsiella*. Klebsiellae were also collected inside the aeration building, inside the stack, and downwind as well, while haemolytic streptococci were captured inside the building in addition to downwind. *Aeromonas*, *Moraxella*, and *Alcaligenes* were identified in the atmosphere inside the building. Salmonellae were identified in the liquid samples from the aeration basins, as were mycobacteria, which were also discovered in the stack lumen. When cultured on Petragnani's medium, the mycobacteria grew as irregular, rough, buff-colored colonies within 2 weeks. Subcultures in vivo for 6 weeks injected into four female tuberculin-negative guinea pigs resulted in gross lesions of the lung, liver, and spleen of these animals. Impression smears of these organs stained by the Ziehl-Neelsen technique showed acid-fast organisms, as did the histological sections.

Effect of ozone. The effect of ozone on counts of airborne bacteria is outlined in table 2, which shows averages of several tests. Apparently, viability is not diminished significantly. The highest viable counts, both with and without ozone present, were found in stages III and IV of the Andersen sampler. This result indicates that these particles were in the 2.0 − 5.5 μm range and therefore may be retained in the lower respiratory tract. The data shown in table 3 reinforce the results in table 2. Additionally, the relative survival of bacteria collected on enriched and nonenriched media is compared in table 3.

Discussion

The data on *Klebsiella* (table 4), the most ubiquitous organism found in this study, indicate that these bacteria are carried from the air above the aeration basins to the stacks and thence to the outside atmosphere via air currents generated by the fans inside the aeration building. Our observations are in agreement with those of Randall and Ledbetter *(4,5)* that Klebsiellae are the best indicators of bacterial air pollution from sewage sources. These investigators correctly observe that there exists a definite possibility of airborne infection from activated sludge plants, where aeration basins are the most important source of pathogens.

Although we have no direct data to support our hypothesis, we believe that Klebsiellae, among many other micro-organisms in the aeration tanks, are being aerosolized by the mechanism described by Woodcock *(8)* and Blanchard and Syzdek *(9)* via bubbles at the air-water interface of a body of water where some micro-organisms are concentrated. The fact that the air inside the aeration building contained an average of 21,800 CFU per cubic meter tends to confirm our belief.

The smaller number of viable bacteria collected in the stack could be explained by the settling of particles. This tendency would be enhanced by the high relative humidity within the building, which could hydrate the particles. The possibility that some bacteria adhere to the stack walls cannot be excluded.

The difference between the average numbers of CFU per cubic meter of air sampled upwind and downwind is most probably due to microbes being carried downwind from the sewage treatment plant, a finding in agreement with the observations of Goff and coworkers *(3)* on the effects of meteorological conditions. We believe that the atmospheric conditions under which we sampled, specifically temperature and sunlight, account for the lower numbers of bacteria collected outside the plant.

The data in tables 2 and 3 indicate that ozone causes no practical reduction in the numbers of bacteria. However, the number of samplings was not sufficient to verify this observation statistically. It is of particular interest, in the light of findings of Zelac and co-workers *(19)* that inhaled ozone can cause chromosome breaks in circulating lymphocytes in vivo, that several sewage treatment plants presently under construction in New York City will employ ozone as a deodorant. The roof of one plant will be used for recreational activities, and the entire complex is located in a densely populated residential area *(20)*. Research is urgently needed to determine how far ozone will travel downwind and still be reactive.

The large differences in viable counts between samples collected on SBA compared with TSA (table 3) indicate that the addition of blood to the medium allows the survival of fastidious or injured organisms or both types. This, coupled with the fact that the collected microbes are within the retention ranges of the lower pulmonary tract, indicates that their entry into the human body could cause disease.

Klebsiellae, streptococci, and mycobacteria are well established respiratory pathogens which could be disseminated by these facilities. *Klebsiella* is commonly isolated from patients hospitalized with urinary tract infections *(21)*. Hospitals take no special precautions for the disposal of infected urine from these patients. It is passed directly into the municipal sewage system. Therefore, it is no surprise that these Klebsiellae find their way into the aeration basins of sewage treatment plants, where they are aerosolized. In his review, O'Connor *(22)* cited several studies which show increased susceptibility to *Klebsiella* infection in the presence of gaseous pollutants. Treatment of infection caused by bacteria aerosolized by sewage treatment plants may be compromised by the increasing resistance to antibiotics of fecal coliforms. Sturtevant and co-workers *(23)* have shown that sewage is an ideal environment for the successful episomal transfer of antibiotic resistance genes among enteric bacteria.

Unfortunately, epidemiologic data on the incidence of infectious disease among sewage treatment plant personnel and among residents of nursing homes and children attending schools in the immediate vicinity of sewage treatment plants were not available to us. Correlation of these data with findings such as ours should be undertaken. The results of our preliminary study indicate that a combined quantitative microbiological and epidemiological study should be carried out to clarify further the role played by sewage treatment plants in the airborne dissemination of disease. Such a project could indicate that feasibility studies be undertaken before the selection of prospective sites for the location of sewage treatment plants.

Conclusions

The bubbling of air into aeration tanks causes some of the bacteria concentrated at the liquid-air interface to become airborne. Thus, these bacteria are found in great numbers in the atmosphere of aeration buildings. The air currents created by fans in the wall of the buildings and in the exhaust stacks carry numbers of bacteria into these stacks and from there into the outside air. Among these bacteria are viable potential respiratory pathogens. Ozonation does not appreciably attenuate these aerosols.

Table 3. Average counts of colony forming units (CFU) in a series of tests in the ozone mixing chamber, using two media for comparison

Stages of Andersen sampler	No ozone		Minimal ozone		Maximal ozone	
	TSA (CFU)	SBA (CFU)	TSA (CFU)	SBA (CFU)	TSA (CFU)	SBA (CFU)
I	33	84	16	45	45	82
II	23	72	28	38	12	45
III	50	133	47	105	88	130
IV	58	153	70	190	65	130
V	23	55	35	40	50	71
VI	5	5	3	17	11	13
Total	192	502	199	435	230	471

NOTE: TSA—trypticase soy agar; SBA—sheep blood agar.

Table 4. Micro-organisms identified in the atmosphere in and around a sewage treatment plant

Organism	Sewage liquor	Inside aeration building	Inside aeration building stack	Downwind from aeration building[1]
Mycobacterium	+	−	+	−
Klebsiella	−	+	+	+
Salmonella	+	−	−	−
Bacillus	−	−	−	+
Flavobacterium	−	−	−	+
Aeromonas	−	+	−	−
Moraxella	−	+	−	−
Alcaligenes	−	+	−	−
Streptococcus	−	+	−	+
Micrococcus	−	−	−	+

[1] No organisms identified upwind of the aeration building.

NOTE: − = no organisms present; + = organisms identified.

Our results point to the existence of a possible health hazard, such as mycobacterial disease, especially for sewage treatment plant workers and for highly susceptible population groups such as young children, the elderly, and the infirm who reside in areas where the atmosphere is contaminated by the gaseous effluent of sewage treatment plants.

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SYNOPSIS

PEREIRA, MARTIN RODRIGUES (Gibbs and Hill, Inc., New York City), and BENJAMINSON, M. AARON: *Broadcast of microbial aerosols by stacks of sewage treatment plants and effects of ozonation on bacteria in the gaseous effluent. Public Health Reports, Vol 90, May-June 1975, pp. 208-212.*

In the aeration basins of sewage treatment plants, compressed air is supplied to diffusers near the bottom of tanks to aid in the conversion by aerobic bacteria of dissolved and suspended solids of sewage into particles that will settle. Air bubbles breaking at the air-water interface will aerosolize bacteria that concentrate in the uppermost microlayer. The microbiological output of a plant in New York City with such a system was monitored.

Samples of the gaseous effluent were collected inside the aeration building, inside the building's stack, 300 meters upwind (background sampler), and 300 meters downwind (test sampler), using Andersen samplers. Among the genera identified in the atmosphere in and around the plant were *Mycobacterium*, *Klebsiella*, and *Streptococcus*, all potentially pathogenic.

The disinfection power of ozone, which is generally used for odor control, was also tested. Samples were taken from the ozone mixing chamber in the stack of the thickening tank building. No significant difference in general bacterial counts could be detected at different levels of ozone production. It appears that in the air, ozone is an ineffective bactericidal agent.

Results in this preliminary study demonstrate the need to evaluate the hazard of microbial aerosols generated by sewage treatment plants similar to the one studied. The possibility of such hazards is of special interest where facilities are located upwind of populations especially susceptible to infections, because of age or debility.

Correlations with epidemiologic data are indicated.

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United States Department of the Interior

OFFICE OF THE SECRETARY
NORTH CENTRAL REGION
230 S. DEARBORN STREET, 32nd FLOOR
CHICAGO, ILLINOIS 60604

ER 76/242

March 26, 1976

Mr. George R. Alexander, Jr.
Regional Administrator
Environmental Protection Agency
230 South Dearborn Street
Chicago, Illinois 60604

Dear Mr. Alexander:

This is in response to your request for comments on the draft environmental impact statement for the Clentangy Environmental Control Center and Interceptor System, in Delaware County, Ohio.

GENERAL COMMENTS

Water Quality/Fish and Wildlife Impacts

The plan for additional ammonia removal and dechlorination to protect aquatic life of the Olentangy River is commendable and should be supported (page 4-27). We believe that final funding approval for the total sewage treatment plant should be contingent upon the incorporation of additional treatment measures, and that OEPA permit No. K 901 AD should be modified to reflect a higher degree of waste water treatment.

The draft environmental impact statement does not describe fully the expected project-caused impacts on the fishery resources of the Olentangy River. The U. S. Fish and Wildlife Service letter and recommendation of July 21, 1975 for 0.003 mg/l limitation on residual chlorine is discussed on page 4-15, but the statement appears nonconclusive in suggesting a 0.01 mg/l level may be more appropriate without addressing what sublethal impact on the fishery resource may be involved with this action. Further, the statement indicates that additional research (Thurston - page I-16) and onsite testing (Fair and Geyer - page I-6) are needed in determining effects of project-caused ammonia on fishery resources. Ammonia nitrogen ultimately should be limited in the receiving waters as determined by bioassays, using the receiving waters and the most sensitive aquatic fish and/or invertebrate species in the locality to determine possible acute and chronic effect of the project discharge on these organisms.

The alternative of relocating the discharge point downstream to an area of lesser biological quality (pages 4-26 and 5-25) suggests that certain stream reaches are to be sacrificed in lieu of additional sewage treatment. This particular alternative is inconsistent with the national goals of providing water quality to insure protection and propagation of fish, shell fish, and wildlife as expressed in Section 101 (a)(2) of the Federal Water Pollution Control Act, as amended. Additional computer simulation is acknowledged as necessary to adequately compare effects (page 5-8).

In the absence of assurances that storm-water management practices will be required in all parts of the service area to limit the increased runoff and stream siltation, the resulting adverse effects on downstream areas, including also the affected flood-protection reservoirs, should be further discussed. The remaining flood-prone areas in the service area that would be made accessible to sewers should also be identified.

We do not find mention of the probable long-term beneficial impact of improvement in ground-water quality as a result of phasing out the use of septic tanks. On page 3-73 we find a discussion of the engineering practice of making allowances for infiltration of ground water into sewer lines; however, we do not find a corresponding evaluation of resultant impacts on ground-water levels and ground-water availability. These impacts should also be evaluated in the final statement.

Aesthetic/Recreational/Cultural Resource Impacts

Although the construction of the sewage treatment plant is in harmony with the 1975 Ohio Statewide Comprehensive Outdoor Recreation Plan (SCORP) in the sense that the Plan recommends initiation of an "intense clean-up program of the existing water resources so that the full recreational potential of Ohio can be realized", we feel there are certain aspects of the project which should be examined in more detail before any final decisions are made. The 1975 SCORP urges giving strong consideration to recreational use of floodplains when formulating zoning ordinances and land use plans. The SCORP also identifies the Olentangy River as a State scenic river with significant recreation resource potential. For these reasons we feel that alternate site locations for the plant should be fully examined as an alternative. We question the conclusion on page 4-3 that because isolation of the OR-7 site may only be temporary the plant should not be located there. Zoning in this area could exclude future housing development from areas close to the plant. Many impacts on valuable river valley recreation lands would then be largely eliminated.

The statement recognizes the potential for increased development in the area served by interceptor lines. However, the only discussion of visual impacts concerns the possibility of seeing the plant itself from Highbanks Park. We feel there should be a broader discussion of the aesthetic impact of future suburban development in the area. These changes may be substantial over the next 20 years and may be largely attributable to the project.

The statement indicates that half of the interceptors will be located along existing highway right-of-way. There is no mention of provisions for the other half of the lines. The final statement should indicate whether rights-of-way will be leased or purchased and whether they will be maintained or returned to a natural condition. They may be suited to providing excellent hiking trails or bike paths.

We also have more specific concerns about impacts on aesthetic and cultural resources of the river corridor and Highbanks Park areas. These concerns are expressed as part of the following section-by-section specific comments.

SPECIFIC COMMENTS

Chapter 2 - - The Environment Without the Proposed Action

Page 2-17, Table 2-5, Water Quality of Olentangy River:
We believe the concentrations of Cd, Cr, Zn, Cu, and Cyanide are incorrectly expressed in milligrams per liter (mg/l) instead of micrograms per liter (ug/l).

The Highbanks Nature Preserve (see pages 2-22 to 2-24) is under consideration for addition to the National Registry of Natural Landmarks, and three archeological sites within Highbanks Park (see pages 2-44 to 2-46) are listed on the National Register of Historic Places.

Chapter 5 - - Environmental Effects of the Proposed Action

Page 5-1, Water Quality and Quantity:
Controversy regarding the 7-day, 10-year low flow of the Olentangy River at the point of the proposed outfall was expressed at the March 16, 1976 public hearing on the draft statement in Delaware, Ohio. Additional U. S. Geological Survey stream flow data should be utilized and incorporated into the final statement to support final selected 7-day, 10-year low flow assumption.

Further, historic stream flow data should be used to indicate the period of time (days) the proposed sewage treatment plant will and will not meet recommended instream dilution of ammonia nitrogen and chlorine for the protection of aquatic life. Presentation of such information quantified on an annual basis would assist the reader in determining the expected extent of such declared short term and reversible impacts (page 5-26).

Page 5-24, Terrestrial Biota:
The final environmental statement should indicate whether or not revegetation of construction routes is contemplated with the project. The statement should include a plan to select and establish trees and shrubs in project-denuded areas to lessen adverse impact on native wildlife species. Further, secondary impacts of any new land developments generated by availability of project sewer hook-ups on wildlife should be discussed in the final environmental statement.

We are pleased to note (page 5-30) that stream crossings of the Olentangy will be designed to reduce construction damage. We note that the Director of the Department of Natural Resources "must approve public projects proposed for designated rivers before they can be commenced. This includes bridges, roads, structures, dams, and channel modifications . . ." (1975 SCORP). We found no indication in the statement that such approval has been requested or received, and feel the final statement should address this issue.

The statement indicates on page 5-31 that the plant will not be visible from the top of the bluffs at an elevation of 890 feet above sea level. The next paragraph indicates that park visitors 100 to 130 feet above the river would be able to see the plant. From Geological Survey maps it appears that these would correspond to elevations of 870 to 900 feet above sea level; i.e., the elevation where the plant was supposedly not visible. We wonder whether this indicates that more than a "fraction of the visitors" to Highbanks Park may be able to see the plant, and suggest a clarification of this point in the final statement. We note, too, that the plant would be visible from certain vantage points along the proposed trail in the park.

It is also acknowledged on page 2-45 that Indian artifacts have been discovered at the proposed plant site. Therefore, the environmental statement should present evidence of compliance with the Procedures for the Protection of Historic and Cultural Properties expressed in 36 CFR Part 800. These procedures require the concurrence of the State Historic Preservation Officer (Dr. Thomas H. Smith, Director, Ohio Historical Council) in a determination of effect and the comments of the Advisory Council on Historic Preservation whenever an effect is determined to be adverse.

We suggest that the proposed action has a high potential for adversely affecting presently unknown archeological or historic resources that may exist in the path of the proposed interceptor sewers shown on page 3-2. The recommendations of the State Historic Preservation Officer on this subject should be presented in the statement. The statement should indicate the scope of the archeological survey that has been conducted, and if the entire project area has not been included, provisions should be made for completing the inventory.

The statement should outline those procedures which will be followed to identify and protect any archeological resources encountered during project construction.

In addition to addressing the project's effect on Highbanks Park, the final statement should also address the impacts on the Olentangy Parklands in Worthington. There is a Land and Water Conservation Fund grant application currently pending for development of 61 acres with bike paths, playground areas, bridges, landscaping and site work on the Olentangy River south of I-270 (Project 39-00438). Locating the outfall downstream from the scenic river segment may have adverse impacts on the recreational use of this park; these impacts should be discussed in the final statement.

Odor impacts. The statement indicates that the prevailing winds blow from the proposed site toward Highbanks Park (page 5-13). The discussion on page 5-35 indicates there is difficulty in accurately determining the synergistic effects of emitting odor-producing chemicals simultaneously. A letter from Mr. Edward F. Hutchins of the Metropolitan Park District of Columbus and Franklin County also voices concern over this issue. Therefore, we feel this requires further study in order to avoid adverse impacts on the park. The prevailing winds will also tend to carry noise impacts more directly to the park.

We appreciate the opportunity to provide these comments. The proposed site is indeed in a sensitive area from a variety of resource aspects, and requires a careful evaluation of its impacts and of alternative sites. We would be pleased to elaborate further or provide technical assistance regarding any of our comments.

Sincerely yours,

Madonna F. McGrath
Acting Special Assistant
to the Secretary

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MAR 26 1976
EPA, WPD, R5
Water Programs Branch

March 16, 1976

Russell E. Train
Administrator
Environmental Protection
  Agency
401 M Street S.W.
Washington, D.C. 20040

Re: Delaware Sewage Treatment Plant

Dear Mr. Train:

Last week, I was contacted by a representative of a Delaware County group opposed to construction of a sewage treatment plant across from Highbank Metropolitan Park. As a county resident and a future candidate for the United States House of Representatives from the 12th Congressional District, I am deeply concerned about this issue and have carefully reviewed the proposal.

I am formally requesting that the Environmental Protection Agency (EPA) not approve the proposed sewage treatment plant at the present time. The effect of this plant on regional planning, the necessity for more research and experimentation to avoid built-in obsolescence, and the environmental impact of the plant compel this position. While we recognize the need for a treatment plant, we must also appreciate the long term problems that short term solutions often produce.

Initially, the sewage problem must be treated on a regional basis. One county or city can no longer pretend that its resolution of this problem does not affect another. For example, the Columbus metropolitan area needs another sewage treatment plant and several developing cities are facing increasing demand for such facilities. The Delaware approach is not sufficiently integrated with existing or planned regional treatment facilities to be acceptable.

The proposal also suffers from the type of plant being built. Delaware should use federal funds for research and experimentation in such methods as self-contained treatment and physical degradation; instead, the proposed plant would use technology that has been insufficient elsewhere and may be obsolete by the time it is operational.

The Delaware proposal is particularly inappropriate because of the real threat of "ecocide" due to the inadequately researched environmental impact of the plant. That part of the Olentangy River has fairly still water and, thus, is vulnerable to toxic effluent that could kill existing fish and plant life. Certainly, EPA must demand a full environmental impact statement before approving the Delaware proposal.

In addition, the proposal disregards the effect of odorous settling lagoons on Highbanks Park. Gilding the plant to put it out of sight will not remove this impact on local citizens' enjoyment of the park and is uneconomical in that such a large percentage of the cost will be spent on camouflage rather than treatment devices and operational expenses.

Due to a consumer fraud trial in Cleveland, I will be unable to appear at the public hearings scheduled on this proposal; nonetheless, I hope to meet in Washington with the responsible authorities to guarantee that these serious considerations are both recognized and resolved.

Very truly yours,

ANDREW J. PUZZICHO
4370 Rutherford Road
Powell, Ohio 43065

#36

I have lived along the banks of the Olentangy River for 15 years, and in close proximity for 25 years. I have seen the drastic changes that can happen to the Olentangy, which can range from a placid country stream to a raging torrent when water is released from the Delaware Reservoir. These changes can occur in one day's time, even within hours, not just during certain seasons. I am concerned with what will happen downstream from a sewage treatment plant in the event of some malfunction in its system. Will effluent be flushed into the
and be carried downstream
river, and how will it affect the life of the river?

I am also concerned that while the plant would be developed to serve perhaps just a small community, the desirability of the area would soon cause a need for expansion of the sewage treatment plant when developers take hold of the land, and more houses are built in the area.

For these reasons I strongly oppose the building of the proposed sewage treatment plant.

Mrs. Marjorie A. Miller
3635 Olentangy Blvd.
Columbus, Ohio 43214

#37

CHUCK PERKINS, Realtor
BUY - SELL - TRADE - INVESTMENT
348 N. STATE ST
Phones 882-4343 or 882-4300
WESTERVILLE, OHIO 43081

FARMS ✶ CITY ✶ SUBURBAN ✶ COMMERCIAL PROPERTIES ✶ RENTALS ✶ MANAGEMENT

March 23, 1976

Mr. Harlan D. Hirt,
Planning Branch
Environmental Protection Agency
230 South Dearborn St.
Chicago, Illinois

Dear Mr. Hirt,

As a resident of Delaware County for the past twenty years and very active in real estate in that area I attended all the meetings held by your orginazation and found that most of the people who are against our county having what is vitally necessary for the continued growth of our county, are people from Franklin County. As one old gentleman from our county said at the meeting they are interested in making us their "dam" county and have only their selfish interest at heart.

My orginazation has been responsible for somewhere in the neighborhood of 250 homes in the phase one section of the proposed sewer project and I am more than aware of the need for the people in our county to get this project underway. There is little that has not been said concerning the project and I am one who says lets quit wasting our money on future studies and get on with the project. The location for the sewer plant seems like it was well thought out and with all the engineering people I have been in contact with totally agree.

I am a complete fighter for equal rights and I also think Delaware County should have its equal rights. There is no reason we should always be subservient to Franklin County. Its time the government shows all the people that they are all equal and grants this sewer project to Delaware County. Our County will be forever grateful.

Sincerely,

Chuck Perkins

Chuck Perkins, Realtor
7623 Garrett Court,
Westerville, Ohio (Genoa Twp.)

#38

National Wildlife Federation

1412 16TH ST., N.W., WASHINGTON, D.C. 20036 Phone: 202-483-1550

March 26, 1976

Mr. Gene Wojick
Planning Branch - EIS Section
EPA - Region V
230 S. Dearborn Street
Chicago, IL 60604

Re: Olentangy Environmental Control Center and Interceptor System
- Delaware County, Ohio

We have read the draft environmental impact statement on the captioned project, and have some problems. Briefly:

(1) It appears as though the grant will facilitate substantial population growth. You project an increase from 13,000 to 61,000 by the year 2000 (pp. 2-47). It is unclear how much of that will be induced by project construction. Further, it is unclear whether the population growth will take place in areas proximate to, or included in, existing areas of development or whether it will occur randomly, and give rise to sprawl. We find no indication in the impact statement that EPA will condition the grant on measures that will inhibit, or restrict, development in environmentally sensitive areas. In this regard we call your attention to Program Guidance Memorandum #50 (June 6, 1975) calling on EPA Regional Offices to evaluate secondary growth consequences, and minimize those consequences which are environmentally unacceptable.

(2) The sewer will be running along the Olentangy River, and will presumably permit development to take place in the floodplain area. It is not clear whether the area has been designated as a flood hazard area by the Flood Insurance Administration, and if so whether the communities in the area have joined the Flood Insurance Program and adopted the requisite land management controls to minimize hazardous development. If the area has not yet been designated by the Flood Insurance Administration or more critically has not been mapped as part of the second, or regular, phase of the Flood Insurance Program) then in order to comply with Executive Order 11296 it is our belief that EPA should take measures to minimize the chance of structural improvement in the flood hazard areas that would otherwise be promoted by project construction. These might include sewer tie-in restrictions, or prevailing on FIA to immediately map the area--which would have the practical effect of discouraging development because of high actuarial insurance rates

(3) We are concerned about development leading to increased run-off, and ultimate degradation of the Olentangy River due to non-point source pollution. Absent a plan for controlling that pollution under Section 208, consideration should be given to the kinds of restrictions that are militated by Executive Order 11296, and suggested by EPA Program Guidance Memorandum #50, supra.

(4) We are also concerned about the impact of secondary development on the aesthetics in the area - particularly on the scenic vistas of the river, and on the important Highlands Park. Can, and should not, conditions be written into the grant to protect those environmental values? Further, we note a reference to the presence of the Bald Eagle in the project area. Has the U.S. Fish and Wildlife Service been consulted and concurred that the project will not further jeopardize the Bald Eagle, or modify or destroy habitat which is critical to its existence? See 16 U.S.C., §1536.

(5) Finally, we are concerned with the outfall from the sewage treatment plant. Apparently, the effluent (particularly because of ammonia and chlorine components) threatens fish kill in an area of the river that is highly sensitive, and at the moment relatively unpolluted. Careful consideration should be given either to more refined (tertiary) treatment, or to moving the outfall further down the river to a place where the water quality is such that the effluent discharge will not be so harmful.

In short, we think there are serious problems with the project, as evaluated in the impact statement, particularly with the secondary growth consequences and the placement of the effluent outfall. Accordingly, we would ask that if EPA proceeds to make the grant, it address the secondary land use consequences by imposing conditions on the grantee which would restrict sprawl, insure protection of sensitive areas, and inhibit flood plain development; and either move to tertiary treatment or change the location of the outfall to a less damaging locus

Very truly yours,

Robert J. Golten
Counsel

CC: Harry Longest, Dir., Water Div., EPA - Region V

#39

DEPARTMENT OF THE ARMY
OHIO RIVER DIVISION . CORPS OF ENGINEERS
P. O. BOX 1159
CINCINNATI, OHIO 45201

ORDPD-R

25 March 1976

United States Environmental
 Protection Agency, Region V
Mr. Harlan D. Hirt
230 South Dearborn Street
Chicago, Illinois 60604

Dear Mr. Hirt:

The Draft Environmental Impact Statement (DEIS) for the Olentangy Environmental Control Center and Interceptor System has been reviewed and is considered satisfactory subject to the following comments.

a. The title of the DEIS is confusing. Should it not be titled "Facilities Plan - Sewage Treatment Plant and Interceptor System - Delaware County, Ohio".

b. It is recommended that the project be identified as Alum Creek Lake, Ohio, throughout the report.

c. The present low-flow schedule for Delaware Lake provides for a minimum release of only 5 c.f.s., but the waste loads and allocations are based on a low flow of 15 c.f.s.

d. Any work on government-owned land will require prior easements.

e. Delaware County will not need a permit to cross Alum Creek with a pipeline so long as excess spoil material from pipeline construction is disposed of at an upland site. All fills in Alum Creek, such as those commonly found in highway construction adjacent to a stream, will require a Department of the Army Section 404 permit for work performed after 1 July 1977.

f. Delaware County will need a Department of the Army Section 10 permit for construction in navigable streams such as the Olentangy River.

g. Reference is made to page 2-13, paragraph 2 of the report. It is suggested that the words "not yet taken from Delaware Reservoir" be deleted. The reason for the deletion is that some water has been taken from Delaware Lake, on an emergency basis, during past years. The recreation facilities at Delaware Lake, with the exception of some picnic facilities at the dam site, were financed by the State of Ohio and are operated by the Ohio Department of Natural Resources under a lease agreement. The recreation facilities at Alum Creek Lake will be financed by the State of Ohio and the federal government and will be operated by the Ohio Department of Natural Resources under a lease agreement.

h. The following comments are made with regard to Figure 3-1 (page 3-2) and Figure 4-2 (page 4-10) of the report:

(1) A sewer line should be shown to serve the New Galena Recreation Site.

(2) The location of the sewer between Cheshire and Peachblow Roads appears to be incorrect. The latest plans furnished by Delaware County show a location along Road 10.

(3) The flow arrow under the work "Africa", east side of lake, should be revised since flow will be toward Cheshire.

(4) It is suggested that the road relocation program for Delaware County be shown and appropriate county road numbers added. For example, Shannon Road no longer crosses the lake. It is also suggested that Cheshire and Africa be identified.

(5) The dam should be identified and designated as complete.

(6) Lift stations should be shown at Cheshire and near Powell Road where gravity line effluent is picked up and forced in a westerly direction.

Other remarks and editorial comments are tabbed and marked in red on the returned DEIS.

This Division, and particularly the Huntington District, are very interested in the subject system being constructed at the earliest practical date inasmuch as the Alum Creek Lake Phase 2 recreational facilities are being designed to utilize the proposed system.

Thank you for the opportunity to review the DEIS.

Sincerely yours,

DONALD T. WILLIAMS
Chief, Planning Division

#40

Metropolitan Parks
METROPOLITAN PARK DISTRICT OF COLUMBUS AND FRANKLIN COUNTY
P.O. Box 72 • 999 Park Road • Westerville, Ohio 43081 • 614/891-0700

Board of Park Commissioners
Robert M. Zollinger, M.D., Chairman
Michael B. Karr
Everett H. Krueger

Director-Secretary
Edward F. Hutchins
Deputy Director
John A. Metzker

March 26, 1976

Harlan D. Hirt, Chief
Planning Branch
USEPA, Region V
230 South Dearborn Street
Chicago, Illinois 60604

Dear Mr. Hirt:

Please enter into the record the attached comments relative to our review of the draft environmental impact statement for the proposed "Olentangy Environmental Control Center"; i.e., Delaware County Sewage Treatment Plant and Interceptor System, Project No. C390698.

Sincerely,

Edward F. Hutchins

Edward F. Hutchins,
Director-Secretary

EFH:akw

Enclosure

cc: CEQ

COMMENTS IN REVIEW
OF
DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR
"OLENTANGY ENVIRONMENTAL CONTROL CENTER"
i.e., DELAWARE COUNTY SEWAGE TREATMENT PLANT
AND INTERCEPTOR SYSTEM

Project No. C390698

Introduction

Our long concern with this proposed project has centered on two consequences of it: the deterioration of the high-quality, natural fishery of the Olentangy River from the sewage treatment plant's outfall, and downstream; the deterioration of the high-quality aesthetics not only of the River's valley but one of the most lovely of its many lovely places.

This concern is not uniquely ours; it is shared in locally by those who regard this last, near-natural remnant of the once magnificent Olentangy and its valley with the same appreciation as Mr. Justice Holmes, who reminded our nation long before the Congress enacted FWPCA 1972 that ". . . a river is not an amenity, but a treasure . . . . " We remind the reviewers of these comments that the issues involved with this project concern, no longer a river, but only a precious remnant of one.

We have asked, cajoled, and argued to persuade governmental agencies at all levels to recognize this treasure, the river and its valley, and to consider for application every reasonable alternative that would mitigate the impact of the discharge and location of the STP on the water and land resources. We have not persuaded them, despite the letter and spirit of the laws, federal and state.

Contrary to the admonition of 40 CFR, Sec. 6.304 that an EIS shall not serve " . . . as a justification for decisions already made . . . " this draft EIS does precisely that, albeit with an insidious skill that would make it appear to one unfamiliar with the jargon, the river and area in question, and the cases involving the National Environmental Policy Act (NEPA) that it serves " . . . as a means for the responsible official and public to assess the environmental impacts . . . . " Section 101(b)(2) of NEPA requires the federal government to assure all Americans not only safe and healthy surroundings but " . . . productive, and esthetically and culturally pleasing . . . " ones as well; Section 101(b)(4) requires preservation of "natural aspects" and the maintenance of " . . . wherever possible, an environment which supports diversity . . . "; Section 101(b)(5) requires " . . . a balance between population and resource use . . . "; and Section 101(b)(6) requires federal actions to " . . . enhance the quality of renewable resources . . . " (emphasis ours). The predeliction of this draft EIS refutes the letter and spirit of these substantive requirements of NEPA. It refutes these requirements as they are further specified in PL 92-500, Sec. 101(a), " . . . to . . . maintain the chemical, physical and biological integrity of the Nation's waters . . . "; and (a)(2) to achieve " . . . an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife . . . . " It refutes the statement in Sec. 101(b) preserving and protecting " . . . the primary responsibilities and rights of States to prevent, reduce and eliminate pollution, to plan the development and use (including restoration, preservation, and enhancement) of land and water resources . . . . "

Ohio has assumed its responsibilities and asserted its rights with respect to water quality standards in Sec. 6111.041 of the Ohio Revised Code stating

that "(s)uch standards shall be adopted . . . to apply to the various waters of the state . . . to enable the present and planned use of such waters for . . . propagation of fish, aquatic life and wildlife . . . . "

Nothing in any of these laws permits a reduction in the quality of the water and land resources. All call, in letter if not in spirit, for the mitigation of impacts, not their aggravation, yet this EIS, sometimes in detail, sometimes peremptorily, discards mitigating alternatives as solicitously as it condones the destruction of the River and its valley.

The Plant Site

The argument against the plant site is not taken solely from the viewpoint of Highbanks Metropolitan Park, but from the viewpoints of total aesthetics and law. We deal with aesthetics first, so perfunctorily treated throughout the EIS, and begin with an odious comparison.

Franklin County and the City of Columbus have destroyed the river valley's beauty through rank urbanization. Where it has proven convenient, a freeway has been built up the River's channel; where that has proven inconvenient, the River has been diverted and/or channelized. At the Franklin County-Delaware County line the change in character and quality of the valley is to move from urban frenzy to rural restfulness. The freeway tapers from its four lanes, to three, to a winding rural two-lane road, drifting along gentle curves, over and down gentle rises, now on the edge of the river, now above small pockets of its floodplain, on to the southern border of Delaware City. The view along this route is rural; farmlands, pleasant residences, wild areas, with a modicum of visual insults. Even the developers, at least for the present, respect its beauty, quantifying the supposedly unquantifiable aesthetics in high dollar terms and minimal building densities. It was the valley's beauty, as well as the quality of the River's waters that led the state to designate this stretch as a Scenic River, and the road, a Scenic Route. The EIS fails to mention this Scenic Route designation. Of all the pockets of memory-etching beauty along the valley, few are more lovely than the proposed site of the STP.

The EIS fails to point out that the site will carve 70 acres out of an existing 400-acre farm. (The County Commissioners are seeking to appropriate the land, contrary to the owner's desires.) The Scenic Route State Road 315 bisects the farm. The parcel lying to the east, between the road and the River, is 160 acres. The 160 acres are floodplain, shelving down from the road to the River, cropped in a corn-soybean cycle. Its backdrop is formed by the mature bank-side trees, the shale "high banks" and forest of the park. The land to the west of the road includes the farm buildings, woodlot and grassland rising abruptly to the "high banks" of the ancient river. Along the road, the length of the farm, and on both sides, are mature maples 60 to 70 feet high which form a canopy over the road in leafing seasons. The EIS notes that this "view" will be mitigated by the camouflage of rustic cedar, pergolas, earthen banks and planted trees. But this is not just "a view," it is a place where pedestrians, bicyclists, motorists can immerse themselves. No amount of rustic siding can camouflage a sewage treatment plant rising from the middle of a farm field any more than calling it, fatuously, an "environmental control center" keeps it from being a sewage treatment plant.

On page 5-29, after the Powell-Olentangy site has been designated as the prime site, this statement is made:

> The advent of sewers will facilitate development of the (immediate) area, including land in the vista from the Highbanks bluff. Acquisition of the property, or of scenic easements on the property, or other measures ought to be taken to ensure the continuance of a pleasing rural view.

This is, to put it charitably, an ingenuous observation. The EPA choice

of the plant site places a sewage treatment plant on 70 acres in the middle of a floodplain (p. 2-21) farm field, thus foreclosing any further options to preserve ". . . a pleasing rural view . . . " or does the author include the camouflaged sewage treatment plant as part of that "pleasing rural view"? In the words of Section 40 CFR, Sec. 6.304(e) this proposed action forecloses the future option outlined. Ironically, or intentionally, this foreclosure is consistent with political intimidation exercised at an earlier time to inhibit the Metropolitan Park District's efforts to purchase the land in fee or otherwise.

Lastly, the selected OR-3 site is a violation of Executive Order 11296 and 40 CFR, Sec. 6.214(b)(2) because it commits to unnecessary use a floodplain and fails to ". . . preserve the unique and significant public value of the floodplain as an environmental resource . . . " when there are cost effective alternatives available.

Alternative Site

Dr. Robert W. Teater, Director, Department of Natural Resources, State of Ohio, shares credit for suggesting ". . . that the plant be located on high ground three-fourths to one mile west of the river to minimize encroachment on Highbanks Park" (p. 3-37). Two sites are suggested as meeting these general criteria--OR-6 and OR-7--and of these two, site OR-7 is chosen over OR-6. The actual presentations and discussions of these two alternatives are sketchy at best, from all standpoints. In each instance, for example, costs are minimally presented, with EPA doing no apparent cost analysis of OR-6 on its own, citing Burgess & Niple's estimate of ". . . the incremental cost . . . to be $1,900,000 . . . " (p. 3-39) and the costs for OR-7 being less than one-third of that total for the force main and about two-thirds for pumping costs. But would OR-6 be this much more expensive? Since it would be located in an area ". . . adjacent to a rail line and hence . . . likely to undergo industrial development . . . " (p. 3-40) thus realistically eliminating the needs for "beautification." Were the costs of the camouflage deducted from the original plant before the "incremental costs" were added? We cannot condone the selection of site OR-7, since it would impact a planned-for core development area of Powell, as well as the natural area of Bartholomew Run (p. 3-40). When these two impacts are qualified in the statement as being "relatively minor" (p. 3-39), when both could be expected to raise the justifiable ire of the citizens of Powell and those landowners concerned with preserving the naturalness of Bartholomew Run, we cannot help but question the objectivity, if not the judgment, of the assessor.

We also question the routing of the force main to site OR-6, its length, hence its total cost. From the sketch on p. 3-38 gravity, that much heralded helpmate of sewerage engineers, seemingly could be utilized to move the lift station south about one-fourth the total length of the force main, reducing head requirements through frictional reduction.

Of all the alternative sites proposed, if given a fair, objective analysis, OR-6 appears to be the most cost and environmentally effective of all those presented. If there are additional costs, they must be weighed against the irretrievable impacts of site OR-3.

Effluent Discharge

"The Olentangy River has regional to national significance as a valuable biological resource" (p. 2-26). The EIS is replete with references to this, though there is an incomplete description of the biota, notably, the failure to set out the inventory of aquatic insects referred to on page 2-26. The decision seems to be not to require ammonia or residual chlorine removal to levels which will protect the biota, but rather to displace the outfall to below the

artificial riffles. This ignores the danger to the downstream biota, which while, perhaps not as rich in diversity as that of the designated Scenic River portion, is, nonetheless, a rich biota, especially for an "urbanized" and much abused river segment. (See letters of Walter T. Momot, esp. p. 6-46, and C. E. Faulkner, esp. p. 6-9.)

The Regional Administrator in granting this application must insure that the plant will operate to produce an effluent which will meet the water quality standards of the State of Ohio, 40 CFR, Sec. 35.835-4, which are found in Ohio EPA regulations, Chapter EP-1, EP-1-02(N) requires:

> All pollutants or combinations of pollutants shall not exceed at any time one-tenth of the 96-hour median tolerance limit for any indigenous aquatic species, except that other more stringent application factors shall be imposed where necessary to meet the minimum requirements of the National Technical Advisory Committee, "Water Quality Criteria," 1968. The median tolerance limit shall be determined by static or dynamic bioassays in accordance with standard methods described in "Standard Methods for the Examination of Water and Wastewater," 13 Edition, 1971, published by the American Public Health Association and Water Pollution Control Federation.

Since Ohio EPA regulations do not define "indigenous aquatic species," but Chapter 6111 of the Ohio Revised Code requires the Ohio EPA to comply with mandatory federal regulations for water pollution control, the definitions under 40 CFR, Sec. 122.1(h) and (i) "representative, important species" and "balanced, indigenous community" give relevant definition to the phrase, even though Part 122 refers to thermal discharges.

It seems obviously requisite that as complete a biotic inventory as may be available should be reported and the necessary bioassays reported or carried out to establish the 96-hour median tolerance limits and the effluent limits adjusted accordingly.

The considered locations of the outfall for the STP are slightly more than arbitrary. Ohio EPA Regulation EP-1-03 "MIXING ZONES" in EP-1-03(B)(1)(a) and (b) set dimensional limits to the mixing zone; (d) prohibits the inclusion of any " . . . spawning or nursery areas of any indigenous aquatic species . . . " within the zone; (e) prohibits the mixing zone from interdicting " . . . the migratory routes of any indigenous aquatic species . . . . " EP-1-03(c)(1) establishes the water quality standards for mixing zones, prohibiting pollutants or combination thereof in excess of the 96-hour TLM. Thus, the location of the outfall, since it controls the shape and dimensions of the effluent plume, must be located with respect to the requirements for mixing zones.

Additional Failings

How can the Regional Administrator report that " . . . the Worthington Hills treatment plant is . . . overloaded" and not require the Ohio Director of Environmental Protection to enforce whatever permits it may be operating under? (FWPCA 1972, Section 309.)

If the fecal coliform counts are "too numerous to count" (p. 2-17) why are not all point sources of these pollutants identified in the EIS, certainly with such a high count, each point source discharging to the River becomes a "significant source" [40 CFR, Sec. 35.150-1(a) and 130.2(n)] and why does the EIS not discuss the reduction of pollutants from all point sources to be expected by the operation of the STP (40 CFR, Sec. 35.150-1 per 35.835-2).

There continue to be serious discrepancies in balancing population figures with capacity of the plant. This is not encouraging in view of the comptroller general's report, December 5, 1975, which reported that of three STP's built in Region V investigated by his staff all three failed to achieve design performance, as well as the EIS report that the revamped Delaware STP " . . . has been prone to frequent upsets, leading to less effective treatment than its design capabilities" (p. 2-18). Table 2-8, p. 2-50, and the 20-year planned life of the project are the bases for this comment. At the earliest, the plant would be on-line about the fourth quarter of 1977, which would project the life of the plant to 1997. The incomplete projections for 1995 show a population of 44,381. If by 1997 only 30,000 are being serviced by the plant, then 14,381 persons will be using septic or package plant systems. That figure compares almost exactly with the 1975 projected unsewered population of 14,452, whose sewage disposal problems are lamented as the immediate need for the plant. Facetiously, the plant will resolve by 1997 the sewage disposal problems of a net 71 persons. Seriously, by 1997, 32 percent of the projected population will not be served by sewerage, and the water pollution problems will have been worsened by storm water runoff from the increased built-up land areas. The population projections indicate that the planned for average capacity should be 4.5 MGD at a minimum. However, in view of the statement that the advent of the plant will lead to increased moderate and lower cost housing with consequent increases in population, perhaps Burgess & Niple's original projection for 6 MGD plant is closer to reality.

A portion of the phase I interceptor appears to be an unallowable cost under the provisions of PL 92500 Sec. 211 and 40 CFR, Sec. 35.903(i) and 35.925-13. On page 3-3 it is stated that, "the first phase consists of a short line along the Olentangy to a proposed residential development . . . . " This section of the interceptor to the proposed development is shown on the sketch "Interceptors-Facilities Plan and Configuration," page 3-2. This same section is included with the proposed interceptors, as is shown on the sketch "Interceptors-Proposed Configuration," page 5-10. Cost of interceptors for new communities or subdivisions are not allowable inclusions in grants.

Conclusions

From the outset of the public introduction of this project one single location has been pushed by the applicants and pressures have been exerted from many quarters to advance that location choice to the exclusion of all others. This draft EIS attempts to give USEPA sanctity to all of those efforts, contrary to the requirements and spirit of the relevant laws, in particulars which we have cited and others which we have not. These foreclosures of mitigating alternatives should be corrected in a revised draft EIS, not a final, and if not, subjected to such further challenge as is available under the laws.

Edward F. Hutchins
Edward F. Hutchins

Richard S. McCutchen
Richard S. McCutchen

cc: CEQ

#41

CLINTONVILLE AREA COMMISSION

183 Irving Way West
Columbus, Ohio 43214
(614) 268-2696

March 29, 1976

Harlan D. Hirt, Chief
Region V Planning Branch
U.S. Environmental Protection Agency
230 South Dearborn Street
Chicago, Illinois 60604

RE: Sewage Treatment Facility, Delaware County, Ohio Project No.
C 390598-01

Dear Mr. Hirt:

The Clintonville Area Commission represents 40,000 individuals who live in an area bounded on the west by the Olentangy River between the southern boundary of Worthington and just north of Dodridge Street, in the City of Columbus. Along this stretch of river, in addition to residences there are several hundred acres of park land accessible to all the residents in the area for recreation. The river is an asset of prime importance to the people living in this area, who also have a substantial interest in the recreational opportunities offered by the river and its surroundings in other parts of northern Franklin County.

The Commission wishes to express concern over the proposal for the sewage treatment project in Delaware County, and in particular over questions of adverse environmental impact that are either not adequately described, or are not sufficiently analyzed, or satisfactorily resolved in the January 1976 Draft Environmental Impact Statement. We wish to bring to your attention the following specific concerns, which are however by no means exhaustive:

The first major concern is the effect of ammonia and chlorine concentrations on aquatic life in the Olentangy River, especially the long-range cumulative effects of high concentrations of these chemicals that will occur during annual periods of low river flow rates. We note in this connection the data and statements in the memorandum of July 21, 1975 from the U.S. Department of the Interior Fish and Wildlife Service over the signature of Regional Director C.E. Faulkner, as well as corroborating evidence from intensive independent studies of the part of the river most directly effected. We do not find in the Draft Statement any adequate response to these statements, reports, and concerns. There is instead an opinion, wholly unsupported by any evidence of data or analysis, by the Ohio E.P.A. to the effect that the anticipated effluent will not seriously harm the fish or other life in the river, and that the additional measures required to reduce the potentially lethal contamination to safe levels are not worth the additional expense. We find the lack of adequate analysis of this central environmental problem to be a major deficiency of the Draft Statement. Nor are we reassured that due care has been taken in its preparation, by the conflicts between statements made in the study about river flow rates and data subsequently reported at the public meeting in Delaware County. We look in the Draft Statement for the kind of chemical and biotic analysis of the present condition of the

-2-

river in the immediately affected area for evidence that an adequately thorough professional study has been carried out, and are concerned that we do not find it.

A second major concern has to do with secondary and collateral impacts of the proposed sewage treatment plant. The Draft Statement itself makes it clear that the viability of the plant is based on the presumption of extensive residential development of southern Delaware County, from approximately 11,000 at present to the order of 60,000. No one to our knowledge has denied that serving a population as sparsely distributed as that now in place in southern Delaware County by a central sewage treatment plant is prohibitively expensive. Since the development is essential to the economic feasibility of the project, the environmental impact of that development is also an essential part of an Environmental Impact Statement. Such a statement should include, at least by reference, the results of a Planned Unit Development analysis that should precede any such commitment as a matter of minimal modern good practice. Such an analysis includes a study of soil conditions and types; water tables, types and groupings of plants that grow in specific environmental areas such as marshes; how present wooded areas and areas essential to existing wildlife would be preserved and protected; planning for transportation networks and community facilities. The present Draft is inadequate in that it fails to deal with these questions at all.

We are also directly concerned with the likelihood of flooding of park land along the river as a result of increased run-off water caused by the proposed extensive development, and with the accompanying increased amounts of oils, petrochemicals and silt contained in storm-water runoffs which will further contaminate the river, and which has the potential to destroy the usefulness of the riverbank park lands in our own neighborhoods.

We observe that the proposed site for the treatment plant is actually in the flood-plain of the river, and we are less than reassured by the assertion that it lies above the "hundred-year-high" level. The consequences to the downstream river and its adjacent communities of a flood that engulfs the sewage treatment plant hardly need spelling out. Our community would be one of those that would take the direct brunt of such an event.

In summary, it is imperative that a far more thorough, detailed, and quantitative investigation of the direct and collateral impacts be made than are found in the January Draft Statement, and that the final impact statement contain the findings and results of such investigations.

Very truly yours,

Philip J Pollick

Philip J. Pollick
Chairman
Clintonville Area Commission

#42

THE OHIO STATE UNIVERSITY

March 29, 1976

Mr. Harlan D. Hirt, Chief
Planning Branch, Region V
Environmental Protection Agency
230 South Dearborn
Chicago, Illinois 60604

Dear Mr. Hirt:

This is to supplement my testimony of March 16, 1976, delivered at the Berlin Township House, near Delaware, Ohio.

My proposal to pump the sewerage north to the Delaware City Treatment Plant and to upgrade the Delaware City Treatment Plant will no doubt be attacked as "not cost-effective." It costs money to pump sewerage uphill. However, there are important benefits to be gained by this proposal which must be weighted against the increased costs.

1. Having one plant operation rather than two should result in less malfunctions in that better personnel could be hired with the same amount of plant operating funds.

2. When the plant does malfunction, the 10 or so miles between the City of Delaware and Powell Road has considerable drop so the water runs fast and the effluent will be cleaned up before it gets to either the best game fishing sites or areas of population concentration.

3. The river below I-270 is slow moving according to the EIS, therefore, the natural river process of "cleaning up" the effluent will be less effective here than at the more northerly spot. It is also in a highly populated area.

Department of City and Regional Planning 289 Brown Hall [illegible]

4. Improved operation of the Delaware City plant will do more to improve the water quality in the Olentangy than any other single step.

5. While the effluent proposed to be put in the river near Highbanks Park will not result in violating water quality standards, if the plant operates according to its design capacity, it will nevertheless reduce the quality of the water at that point. The very good quality of the water at that point is the reason additional effluent can be introduced without violating standards.

6. The same effluent may be able to be put in the water at the Delaware City Treatment Plant and result in an improvement in water quality, depending, of course, on the degree of pollution currently provided by the Delaware City Treatment Plant.

7. The added annual costs of this proposal must be considered both as a lump sum and in terms of additional costs to be borne by each user during the 25 year life of the bonds that pay the local share. A conservative basis of calculation would prorate these annual costs to the number of users expected to be served by the first phase at the end of the 5th and/or 10th year of operation of the facility.

8. Surprisingly, these added costs can be considered an asset or a liability depending upon one's conception of the purpose of the project. If the purpose is solely to "restore and maintain the...integrity of the Nation's waters," the added costs are an asset so long as they reduce the extra incentive the cost savings of this project provides to locating a home in Southern Delaware County. This assumes that the additional costs will not be so great as to make the septic tank option truly competitive - that is, the costs per lot for the central system will still be equal to or lower than the septic tank option. The closer the central system costs approach the costs of the septic tank option, the less additional incentive to relocate to Southern Delaware County. However, some small cost advantage to the central system should probably be retained to encourage use of the central system, when that option is available.

Presumably, this cost advantage could be very small because of the problems residents of the area are now experiencing with septic systems. Undergirding this argument is the assumption that the extra people attracted to Delaware County by cost savings due to a central sewerage system will contribute to river pollution via surface run-off and via an additional load on the sewerage treatment plant.

These added costs can be considered a liability if the purpose of the project is to provide a central sewerage system at minimum costs.

9. If the purpose of the project is to provide a central sewerage system at minimum costs, the possibility of joining the Columbus system must be re-examined, for several of the regional alternatives were shown by the EIS to be much cheaper than the proposed plant on the Olentangy.

10. I would hope that EPA, of all agencies, has escaped from the oversimplification that the purpose of a public investment is to provide a given service at minimum costs. It was precisely this standard which, among other actions, created the environmental problems which led to the creation of EPA.

Sincerely yours,

W. Raymond Mills

W. Raymond Mills
Associate Professor
City and Regional Planning

WRM/ep

You must be concerned about the secondary population impacts and the special water quality benefits provided by the Delaware City alternative

#43

LOCH LOMOND ENTERPRISES
ON THE OLENTANGY RIVER ROAD • P. O. BOX 167, WORTHINGTON, OHIO 43085

March 26, 1976

Mr. Harlan D. Hirt, Chief
Planning Branch
U.S. E. P. A. Region V
230 S. Dearborn St.,
Chicago, Illinois 60604

Dear Mr. Hirt:

I attended the afternoon and evening meetings held in the Berlin Township house in Delaware County on March 16th and wish to compliment you on the diplomatic manner in which you handled the meeting, especially regarding those in the audience who tried to engage in a dialogue with some of the speakers with whom they disagreed.

When registering in the afternoon, I indicated that I would appreciate obtaining a transcript of the two meetings, and one of the reasons for this letter is to confirm my previous request. Through my attendance at one of your earlier meetings held by your office last year,my name was put on your list of those who were to receive a copy of your EIS which was the subject of the hearings on March 16th, and I thank you for my copy.

My interest in this entire proceeding is a vital one because I am the Manager of Loch Lomond Farm which comprises about 420 acres, including the 140 acres of flood plain land west of the Olentangy River and east of Rt. #315. Part of this acreage has been picked as the site for the new Delaware STP. This is prime agricultural land which has been farmed successfully every year since its purchase 35-yrs. ago by William C. Denison. Since Mr. Denison's death in 1963 I have been employed by the Huntington National Bank of Columbus, Trustee under Mr. Denison's last will. I went to work in 1942 for Mr. Denison as his assistant and Executive Secretary so my association with his family covers 34 years.

In all of the newspaper publicity since the Delaware STP became an issue, no mention has ever been made that the new STP is to be located on the Loch Lomond Farm. Mrs. Denison's home is located on the high ground west of Rt. #315 and her main driveway will be directly west of the new STP. The drive entrance from Rt. 315 is within 500 feet west of the SSP. Her home is 1200 feet west of Rt. 315. It is a 5 bedroom home built of native limestone with a red Ladovici tile roof, a detached 4-car garage built underground and having two walk-in refrigerated rooms, an outside patio elaborately landscaped overlooking a 3-acre lake in the ravine that feeds the stream intersecting the site of the new STP. This is a very scenic home, surrounded by 300-yr. old oaks and hickories and a grove of black walnut trees. About three-fourth of the 280 acres west of Rt. #315 is wooded with some pasture land dividing the wood lots. It has been our practice for at least 25 years to mow the grass on the Rt. 315 right-of-way. The sugar maple trees which line both sides of this highway present a beautiful picture when cool weather in the fall changes the color of the leaves.

After listening to all of the reasons given by those who favored the site which lies on Loch Lomond Farm, as well as those who opposed that location, it seems to us that one of the best solutions to the problem would be to include the lower half of Delaware County within the area-wide regionalization of an enlarged Columbus STP to handle increased loads. New interceptor trunks were added to an enlarged Columbus STP where necessary to take care of the Minerva Park abandonment of its package plant some years ago and another new trunk line to Dublin on the east side of the Scioto River will handle that situation.

At present, most of Franklin County's small villages and larger cities have contracts with Columbus to handle their sanitary sewage. We have reference to Whitehall, Bexley, Upper Arlington, Grandview Heights, Grove City,Hilliard, Worthington, Dublin and Westerville. In the case of Westerville and Dublin, both cities will be using Columbus trunk lines to take care of sewage originating in Delaware County. Through its annexation of 1100 acres in Delaware County the City of Dublin is providing Columbus handling of that sewage coming from Jack Nicklaus famous Muirfield Golf Course and its surrounding of high-priced homes in the Muirfield area. Columbus is now building a trunk line on the east side of the Scioto River to take care of Dublin and Muirfield's 1100 acres in Delaware County. Towns on the east side of Franklin County will be served by a new trunk line 8-ft. in diameter from Columbus' southerly plant. This will include Reynoldsburg, Black Lick, New Albany and possibly Sunbury.

Delaware County saw an opportunity about a year ago and filed a revised application for 1/3 more federal funds to take care of the recreation area around Alum Lake. The proximity of Alum Lake to the Alum Creek trunk line would have been a less expensive disposition of this sewage problem and eliminated a force main lift pumping station to carry this sewage over the hump between Alum Creek and the Olentangy site. Minerva Park's sewage problem was handled nicely several years ago when Columbus built the Alum Creek trunk. Lift Stations are costly when they need repair as Columbus found out in 1973 when they spent some $90,000 to fix their 2nd Ave. Lift station.

Use of smaller package plants was advocated by some of the speakers who opposed the Loch Lomond site. Noise and odors were the principal objections to the High Banks Park people. The pollution of the Olentangy River by the present Delaware County STP seems to be ample cause to enlarge and improve this plant's operations. If the money being appropriated for a new down-river plant were to be used in modernizing and enlarging the old plant, it would preserve the future scenic beauty of the Olentangy. The DelCo water plant could save a large amount if it did not have to spend so much money for chemicals to try and clean up the present Olentangy water supply.

Thank you very much for your past consideration of this environmental problem ... We are hoping for a reasonable solution which we think the area-wide plan offers.

#44

LOCH LOMOND ENTERPRISES

ON THE OLENTANGY RIVER ROAD • P. O. BOX 167, WORTHINGTON, OHIO 43085

Mr. Harlan D. Hirt -3- 3.26.76

We are looking forward with much optimism to a satisfactory solution which we feel sure, will protect the scenic beauty of this fine Olentangy Valley.

Sincerely submitted,

ESTATE OF WILLIAM C. DENISON, deceased, d.b.a.
LOCH LOMOND ENTERPRISES

FWCavanaugh

Francis W. Cavanaugh, Manager

FWC:C

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240 Erie Road
Columbus, Ohio 43214
March 25, 1976

Mr. Harlan Hirt, Chief
Planning Branch
EIS Preparation Section
USEPA, Region 5
230 South Dearborn Street
Chicago, Illinois 60604

Dear Mr. Hirt:

I am greatly concerned about the plans for the new sewage treatment plant proposed for Delaware County, Ohio. I realize there is a need for this plant, but I question whether the chosen site will do more good than harm to the surrounding area.

Many of the adverse effects resulting from this plant could prove disastrous for the fisherman, canoeist, park user and those who live along the Olentangy River. I have lived in Clintonville most of my life and still remember when I caught my first bass from the Olentangy. I hate to think that future generations will never experience such a thrill. I believe it is this generation's duty to preserve our natural surroundings so that others may enjoy them as we have.

Today, water pollution alone is costing us about $11.5 billion in damages each year to human health, wildlife and property. Rather than trying to find a less harmful spot to dump the effluent, why not spend the money to remove the ammonia and chlorine before it goes into the river. I think you should realize there is no quick, simple solution for this problem. It requires a great deal of study and time.

I do not feel the draft EIS covered the problem suffiently to arrive at an acceptable conclusion. I strongly suggest you reconsider your decision on the sewage treatment plant for Delaware County.

Sincerely,

Cynthia D Barnes

Cynthia D. Barnes

#45

[illegible] [illegible], 197[illegible]

Attention: Mr. [illegible]

Dear Sir:

I am writing you concerning the matter of the sewage [illegible] to be built in the Olentangy River north of Columbus, Ohio.

I am a housewife living in north Columbus 3 blocks east of the river. My family and I have spent many many happy times both driving along its scenic route further north and hiking and exploring along its banks near to home.

I have a 9 yr old son and am very concerned about the future of the river in this state.

Highbanks Park is a wonderful famous spot, too, and we feel it is incredible to [illegible] what could possibly be a sewage plant built on its beautiful banks.

We realize that growth is necessary and must be dealt with but do [illegible] [illegible] alternatives must be [illegible] at the same time and not be changed [illegible] [illegible] [illegible] [illegible] the [illegible] in [illegible] [illegible] judgment.

I am just one very concerned citizen & can not [illegible] [illegible] organized groups but I feel I must voice my feelings on this matter.

Sincerely,

Mrs. [illegible] (Margaret) Mc[illegible]
and son [illegible]

ENVIRONMENTAL PROTECTION AGENCY
RECEIVED
MAR 30 1976
PLANNING BRANCH - Region V
FILE NO.

57 Sheffield Rd.
Columbus, Ohio 43214

#46

March 29, 1976

Mr. Harlan Hirt
USEPA
230 South Dearborn Street
Chicago, Illinois

Dear Sir:

Having listened to the Columbus Town Meeting program on Sunday, March 28, 1976, we are convinced that the proposed new sewage treatment plant for southern Delaware County should not be built. We feel that it is of too limited scope to make a real improvement in the area's sewage problem. We believe that a regional consolidation solution would be much more appropriate and that the money involved would be best spent in improving and expanding the current sewage facility for the City of Delaware. This plant could be made to serve the same small area as the proposed facility and, as we have heard, is in need of improvement and expansion anyway.

Since we are also interested in Highbanks Metropolitan Park, we want to express our concern that the proposed facility will have a detrimental effect on the park and it's environs. This is too nice and unique a park to have it degraded by the proposed facility.

Sincerely,

Jane R. Kleber

John J. Kleber
Jane R. Kleber
1955 UpperChelsea Rd.
Columbus, Ohio 43212

#47

State of Ohio Environmental Protection Agency, Box 1049, 361 East Broad Street, Columbus, Ohio 43216 (614) 466-8565

April 1, 1976

James A. Rhodes
Governor
Ned E. Williams, P.E.
Director

Re: Draft EIS - Olentangy Environmental Control Center and Interceptor System - USEPA

Ms. Cathy Grissom
EIS Preparation Section - Planning
USEPA - Region V
230 South Dearborn Street
Chicago, Illinois 60604

OhioEPA

Dear Ms. Grissom:

The Ohio Environmental Protection Agency has been charged, by the Governor, with lead agency and review coordination responsibilities for the State of Ohio on Federal Environmental Impact Statements. The above mentioned Draft Environmental Impact Statement has been reviewed by sections of this Agency, the Ohio Department of Natural Resources, and the Ohio Department of Economic and Community Development. The following comments constitute those received from the above agencies and have been coordinated under the auspices of the State Clearinghouse.

General:

This document, as a whole, was well done; all impacts being explored in a professional manner. There is, however, one area of importance which must be clarified at this time to prevent unnecessary expenditures on this project. As was stated in the public hearing on this project, it has been verified by Ohio EPA that water quality requirements can be met with the discharge located at the proposed sewage treatment plant site at all times.

The requirements for meeting both ammonia and chlorine toxicity limitations in the Olentangy as developed by Ohio EPA personnel were based on the guaranteed minimum release rates from Delaware Lake by agreements between the Army Corps of Engineers and the State of Ohio, and the past history of flow records. The lowest of these flows is approximately 7 cfs greater than indicated in the Impact Statement. Ohio EPA investigation of flow records from 1955 to 1974 indicate the lowest flow of record to be approximately 13 cfs and occurring in the months of June and November.

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A computer analysis has been done for the plant discharge, assuming the Delaware City Sewage Treatment Plant meets NPDES permit requirements, and the Worthington Hill Sewage Treatment Plant discharge is removed from the river. This analysis shows conclusively that water quality standards for un-ionized ammonia (.02 mg/l) in the Olentangy River will be met during minimum summer and winter flows with prevailing water temperature and pH conditions. Only during recreation season low flows must provision be made for the dechlorination of the sewage treatment plant effluent after adequate disinfection to meet the required water quality standard of 0.003 mg/l for total Residual Chlorine. Operation of these dechlorination facilities could be controlled by telemetered stream flow information obtained at the USGS gaging station, and/or by other information being obtained by Ohio EPA during this time period.

The plant as designed will consistently and conservatively produce an effluent of 1.0 mg/l or less of ammonia nitrogen.

The model computer used, low flow regimes, assembled data, and output from computer runs made may be examined at the Water Quality Standards Division Office, OEPA, 361 East Broad Street, Columbus, Ohio.

We would appreciate this information being investigated prior to any final decision on this project, as it has implications on both outfall location and treatment design.

With regard to outfall location, there was little support for the extended outfall among the reviewers. Right-of-way constrictions were the major concerns expressed, as well as the lack of discussion on impacts that would accrue to land uses surrounding the outfall. There is a proposed Columbus City Park project being planned as part of the state route 315 extension in the area of the outfall. The project includes relocation of approximately 2,000 feet of the Olentangy River. As part of the mitigation for natural stream channel loss, a riffle-pool area (1,600 feet) is being considered for construction. It may be anticipated that improvement of the fishery will be experienced, possibly equalling that of the riffle-pool at the I-270 project area. In addition, the City of Worthington is developing a park on the east side of the river in the vicinity of the outfall. Since the previously mentioned computer analysis shows that water quality will be met at the proposed site, we can see no reason for extended outfall.

Comments were received concerning the lack of quantification or qualification of impacts on water quality which would ensue from developments and urbanization in the planning area. Some impacts that were felt to be in need of further investigation included increased run-off, sedimentation, decreased ground water infiltration, increased flood levels, loss of agricultural production, and industrial pollution.

It should be noted that the developments will occur, however, due to the presence of the regional water system.

Coupled with these secondary impacts was the question of the "ultimate" capability of the proposed Sewage Treatment Plant with implementation of every possible improvement or enlargement. Page 3-102, paragraph 1, last sentence mentioned the plant being "flexible enough to allow subsequent additions of any size desired." The secondary effects of this were not discussed, however, in the Draft EIS.

Specific Comments

1) It was not evident from the Draft EIS that section 6.30(e) of the Federal EIS Regulations "relationship between local short term uses of man's environment and the maintenance and enhancement of long term productivity" had been addressed.

2) Chapter 3, page 70 notes one percent of capacity in the Columbus system being attributable to the Delaware County area while Chapter 3, page 82, notes a different percentage. Clarification of this should be accomplished.

3) Chapter 5, page 10, discusses metal constituents present in industrial waste with the statement that high concentrations of these constituents would be adequately pre-treated. "High concentrations" should be defined to insure adequate pre-treatment.

4) Information contained in Chapter 2, Section 3, needs correction. O'Shaughnessy Reservior does not support good populations of small-mouth bass, rock bass or walleye (Chapter 2, page 25). Hoover Reservior does not contain sport fishing species similar to the O'Shaughnessy Reservior (Chapter 2, page 25). It is not currently planned to stock white bass or muskellunge in Alum Creek Reservoir (Chapter 2, page 16).

5) If, in fact, there is a need to remove more ammonia, denitrification is not the answer. It can be shown that there will be virtually the same amount of ammonia in the effluent before denitrification as after. Denitrification is employed to remove nitrogen not ammonia. Denitrification also produces an anaerobic effluent which would have to be post-aerated before discharge. It is felt that more investigation may be necessary to justify the effectiveness of this process.

Ms. Cathy Grissom
Page 4
April 1, 1976

6) It was noted in the Public Hearing that the Corps of Engineers periodically releases water into the river from Delaware Lake. Any impacts which this action might have on plant functioning should be addressed.

7) On the basis of scenic river designation the Ohio Department of Natural Resources will not object to the treatment of plant location, OR-3, if the plant is screened with landscaping and adequate tree cover upon completion of construction. It is suggested that evergreen plantings (i.e., white pine) occur initially followed by planting of indigenous hardwoods. The hardwoods would provide a natural aesthetic screening of the plant during the summer months and the evergreens providing aesthetic screening during the winter.

Pursuant to Section 1501.17 of the Ohio Revised Code, construction plans must be submitted to the Director of the Department of Natural Resources for approval. This includes plans for supportive systems including interceptor lines and trunk sewers.

In conclusion, it should be noted that while the state is aware of the complexity of the situation within this portion of Delaware County, the need for solutions to existing problems in the area is equally evident. The proposed action meets those needs, and in meeting them has received the approval of all state agencies reviewing this document. Our major concerns with the document lie in the areas of solving the problem while not expending excessive amounts of public funds for unnecessary treatment processes. We hope that the information we have provided, and will provide in the future, will aid U.S. EPA in the determination and funding of environmentally sound solutions to pollution problems within our state.

We appreciate the opportunity to comment on this Draft Environmental Impact Statement and look forward to receiving the Final EIS on this project.

Sincerely,

Ned E. Williams, P.E.
Director

NEW/cr
31500.0

2. Responses

(Including public hearing submissions not included in the hearing transcript.)

1. Delaware County Engineer 2-23-76

Response: a. Streamflow

An expanded discussion of this topic appears in section E-2 of Chapter 2, along with the rationale for using the calculated low flow figure. Flow augmentation is difficult, as noted in that section and in Appendix J.

b. Worthington Hills treatment plant

This facility will be phased out in 1977, because of its permit stipulating zero discharge at that time. Its flow is less than that proposed for the Delaware County facility. Increased quantities of this quality would severely impact the stream particularly during low flow periods.

c. Outfall sewer construction

Section G-1 of Chaper 4 discusses our present position on the extended outfall.

d. Public input

Public input is an important part of the EIS process. Extensive public interest has been shown in this project at the public hearings and in the numerous letters received by EPA. Additional cost and streamflow information, for example, have been presented in the Final EIS, in response to requests from the public.

e. Service to Powell

The present status of the Powell grant is discussed in section B-1 of Chapter 3.

f. Population

The referenced error has been corrected to 28,591.

2. William Brungs, USEPA Environmental Research Laboratory, Duluth, Minn. 2-19-76

Response: This recommendation has been incorporated into section E-2 of Chapter 4 and Appendix H.

3. Bernard Griswold 2-23-76

Response: a. Regionalization

This is discussed in Chapter 3 and 4.

b. Extended Outfall

Additional discussion is provided in section G-1 for the outfall and in section E-2 for additional treatment, both in Chapter 4. The discussion of area parks has been extended throughout the Final EIS.

c. Streamflows

New information may be seen in section E-2 of Chapter 2. This is consistent with the guaranteed minimum release.

4. City Engineer, Westerville, Ohio 3-2-76

Response: These water quality concerns on Alum Creek are indicated in section A-4 of Chapter 5.

5. Delaware County Engineer 3-10-76

Response: a. Extended Outfall

Section G-1 of Chapter 4 deals with our current position.

b. Dechlorination

Section E-2 of Chapter 4 and Appendix H present our discussion on the need for chlorine control.

c. Ammonia

The ammonia section, E-2 of Chapter 4 has been revised for the Final EIS.

d. Interceptors

These corrections have been made.

6. Sandra Hall 3-15-76

Response: a. Park Impacts

Section E-5 and F of Chapter 5 covers these.

b. Biota

See section D of Chapter 5.

c. Regionalization

Chapter 4 compares local and regional choices.

7. Lee Csuri, Trustee, Clintonville Area Residents Association, Columbus 3-10-76

Response: a. Biota

Section D in Chapter 5 covers these impacts.

b. Development

Section C discusses development in Chapter 5.

8. James and Ruth Oberla 3-16-76

Response: a. Development

See section C, Chapter 5.

b. Biota

Section D of Chapter 5 discusses aquatic life.

9. Marshall A. Moser, Jr., Executive Director, Ohio Chapter, the Nature Conservancy 3-16-76

Response: a. Secondary impacts

Section C of Chapter 5 discusses these considerations; USEPA has no major role in local land use controls, even though its projects may have secondary impacts which will affect the local area.

b. Regionalization

Chapter 3 has expanded considerations of cooperation between Delaware and Franklin Counties.

c. Extended Outfall

Additional discussion may be found in section G-1 of Chapter 4.

10. Martha Murphy 3-16-76

Comment noted.

11. Gail Pipes 3-16-76

Comment noted.

12. Connie Schneider and Valerie Oberla 3-16-76

Response: a. Scenic River - See section E-8.

b. Biota - See section D.

c. Downstream Impacts - See section A-4.

d. Odors - See section F-2.

e. Aesthetics - See section F.

All of these are in Chapter 5.

13. Connie Lynn Chalmers 3-26-76

Response: a. Aesthetics - See section F, Chapter 5.

b. Scenic River - See section E-8, Chapter 5.

c. Biota - See section D, Chapter 5.

d. Site Alternatives - See Chapters 3 and 4.

14. Steven and Paul McCaw 3-16-76

Response: a. Aesthetics - See section F, Chapter 5.

b. Noise - Section F, Chapter 5.

c. Odors - Section F, Chapter 5.

d. Endangered Species - Section E-3, Chapter 5.

e. Chlorina and ammonia - Section E-2, Chapter 4.

f. Biota - Section D, Chapter 5.

g. Downstream impacts - Section A-4, Chapter 5.

h. Regionalization - Columbus - Chapter 4 compares this with local alternatives.

i. Regionalization - Delaware - Chapter 3 has eliminated this alternative.

15. Lloyd P. May, M.D., Delaware County Health Commissioner

Response: a. Soil Unsuitability for Septic Tanks

This was emphasized in the Draft EIS and is included in section C of Chapter 2.

b. Land Use

Future planning is important, at the local level. See section C of Chapter 5.

c. Water Supply Protection

This desirable benefit is discussed in section A-4 of Chapter 5.

d. Need to Avoid Delay

Comment noted.

16. Lovell M. Parsons and Patrick E. Blayney, Basic Design Associates, Westerville 3-9-76

Response: a. Septic tank impact

This impact was considered adverse with respect to groundwater and surface water quantity, as septic tanks provide moisture to the soil and water bodies. Quality is also an important consideration.

b. Extended outfall

Our present position is presented in Chapter 4, section G-1.

c. Costs per customer

Section C-3 develops this topic in Chapter 4.

d. Mitigative measures adverse project effects

Cost for mitigative measures are eligible for 75% federal funding. These costs are discussed in section C-3 of Chapter 4 and are appropriately part of the total grant for project construction to reduce adverse project effects.

e. Need for system

This has been established by comparison to the no action alternative.

f. Powell

The present status of the Powell grant application is covered in section B-1 in Chapter 3.

17. Richard P. Fahey 3-18-76

Response: a. Regionalization

These legal alternatives have now been explored in section C-9-e of Chapter 3.

b. Priority list

This project is serving a larger area than when it was first planned. Its high ranking on the priority list reflects its being a new treatment plant, its location to protect a scenic river, a population that is larger than many projects, and being in the Scioto basin, a high priority area for water quality control.

c. Extended outfall

See section G-1 of Chapter 4 for the revised discussion.

18. James L. Brimeyer, City Manager, Worthington 3-18-76

This material was presented by Mr. Brimeyer at the public hearing.

19. Delaware Soil and Water Conservation District 3-19-76

Response: Severe soil conditions have been noted in section C of Chapter 2, as well as in the Draft EIS.

20. James Thompson 3-19-76

Response: a. Biota - Chapter 5, section D.

b. Aesthetics - Chapter 5, section F.

21. James F. Turner, President, Northwest Area Civic Association, Worthington

Response: Section G-1 in Chapter 4 discusses our present position on the extended outfall.

22. Natalie Yiamouyianuis 3-19-76

Response: a. Citizen participation

Public hearings on the Environmental Assessment and the Facilities Plan were held by Delaware County on January 29, 1974 and July 31, 1974. An informal community meeting was held by USEPA on May 21, 1975. This was not required by our regulations, but was held to augment public input into the EIS process. The March 16, 1976 public hearing on the Draft EIS lasted over seven hours. Numerous letters have been received by USEPA from area residents.

b. Chlorinated hydrocarbons

Section A in Chapter 5 evalutes these compounds.

c. Stream Discharge of Effluent

Alternatives have been discussed the beginning of Chapters 3 & 4.

d. Cost analysis

This is detailed in section C-3 of Chatper 4.

e. On-site treatment upgrading

Discussion of this may be found in section A of Chapter 3.

23. Shirley A. Decker, President, Worthington Hills Civic Association 3-22-76 and 3-24-76

Response: a. Well impacts

Additional discussion is in section A of Chapter 5.

b. Airborne pathogens

Section B-2 convers this topic in Chapter 5.

c. Odor

See section F-2 of Chatper 5.

d. Flow

This has been largely resolved by your letter of March 24, 1976.

The figure used in the Draft EIS is 100 gallons per person per day. This is an average figure, with some households using more than others. Water supply figures tend to be higher than sewage influent figures because of loss in the water transportation system (perhaps 10%) and of losses due to evaporation, lawn watering, etc.

24. John Nesser 3-76

Response: a. Biological Impacts - Section D, Chapter 5.

b. Reliability - Section G, Chapter 5.

c. Flow - Section A-1, Chapter 5.

d. Noise - Section F-3, Chapter 5.

e. Odor - Section F-2, Chapter 5.

f. Development - Section C, Chapter 5.

g. Regionalization - Chapters 3 and 4 develop the regional alternatives.

25. Tom H. Nagel 3-22-76

Response: a. Reliability statistics - Chapter 5, Section G.

b. Chlorine and Ammonia Impacts - Section E-2 of Chapter 4.

c. Water quality - Appendix B.

d. Assigning values for adverse and beneficial impacts

This approach has not been chosen for this EIS, because it involves using a common denomenator to compare dissimilar things.

26. Martha Genheimer 3-20-76

Response: a. Site - Chapter 3 selects the local site.

b. Scenic River - Chapter 5, Section E-8.

c. Park Impact - Section E-5, Chapter 5.

27. Mr. & Mrs. K.L. Phelps 3-23-76

Response: a. Aesthetics - Chapter 5, Section F.

b. Biota - Chapter 5, Section D.

28. Laura Dees Kloth, Chairperson, Delaware County Environmental Health Committee 3-22-76

Comments noted.

29. Patrick E. Blayney 3-76

Response: a. Site - Chapter 3 discussed site alternatives.

b. Growth - Section C-2, and C-3, Chapter 5.

c. Reliability - Chapter 5, Section G.

d. Low flow augmentation

This possibility is addressed in Section D of Chapter 2.

30. Melva Hunter, President
Stephanie Cannon, Land Use Chairman
League of Women Voters, Delaware 3-76

Comments noted.

31. U.S. Department of Health, Education and Welfare 3-25-76

Comments noted.

32. Alen Hershaft, Envio Control, Inc., Rockville, Md. 3-24-76

Response: a. Cost per Home

Section C-3 provides a cost breakdown in Chapter 4.

b. Flow Reduction

Section A-1 discusses this in greater detail in Chapter 5.

c. Reuse

See Section A, Chapter 3.

d. Local Systems

Local and regional systems are compared in Chapter 4.

e. Regionalization with Columbus

See Chapter 4.

f. Water Quality Data

Additional data are in Appendix B.

g. Chlorine and ammonia

A new discussion may be found in Appendix H and Section E-2 of Chapter 4.

h. Low flow values

Section E-2 of Chapter 2 clarifies this.

33. C. Joseph Cross, M.D. 3-19-76

Response: Air-borne pathogens are discussed in Section B-2 of Chapter 5.

34. U.S. Department of the Interior 3-26-76

Response: a. Chlorine and Ammonia

Additional details are given in Section E-2 of Chapter 4.

b. Extended outfall

The present position is given in Section G-1 of Chapter 4.

c. Stormwater management

Section C-3 addresses this topic in Chapter 5. Once 208 planning is initiated, non-point pollution sources will be studied in part of the area.

d. Flood prone areas

Regulation of flood plain use is discussed in Section C of Chapter 5.

e. Recreation impacts

Downstream recreation areas have been addressed in Chapter 5, Section E-5.

f. Site OR-7

Zoning changes would be a local responsibility, for whatever site is chosen. Site OR-7 has been eliminated because of substantially higher costs.

g. Visual impacts

Except for several existing homes, any homes which would be adversely affected visually by the facility would be new. Mitigative landscaping and architecture would apply to the facility from any view point.

h. Rights-of-way

Rights-of-way will be purchased and revegetated.

i. Water Quality

This has been changed to micrograms.

j. Historical Sites

The addition of two archeological sites to the National Register of Historic Places since the Draft EIS was prepared is noted in Section I of Chapter 2.

k. Streamflow

Section E-2 expands on the low flow issue in Chapter 2. Chlorine and ammonia are discussed in Appendix H and in Chapter 4, Section E-2.

l. Wildlife

Revegetation will occur along the interceptor routes. Landscaping is presented in the project's plans and specifications. Secondary impacts to wildlife are discussed in Section C-2 of Chapter 5.

m. DNR approval of river crossings

This has been noted in the Final EIS.

n. Visibility

Section F-1 clarifies this point in Chapter 5. Vegetation provides a substantial visual buffer at most points on the overlook.

o. Historical impact

We are in communication with the SHPO for historic impact evaluation. Appendix J includes recent correspondence.

p. Prevailing winds and odor and noise

Sections A-2 and F discuss these topics in Chapter 5.

35. Andrew J. Ruzicho 3-16-76

Response: a. Regionalization

Chapters 3 and 4 discuss regionalization.

b. Treatment

The proposed plant is a tertiary facility, also utilizing phosphorus removal and ozonation; this is a sophisticated and up-to-date facility.

c. Biological impacts

These have been addressed in Chapter 5, Section D. Also chlorine and ammonia are covered in Chapter 4 and Appendix H.

d. Odors

No lagoons are proposed for this facility. Sludge facilities and the tertiary filter are enclosed. Odor control is further discussed in Chapter 5, Section F-2.

36. Marjorie A. Miller 3-76

Response: a. Impact of flow variations on possible malfunctions

Treatment plant reliability is discussed in Section G of Chapter 5. Flow regulation is discussed in Section E-2 of Chapter 2. High flow releases would reduce the proportion of effluent in the stream, and not create any particular problems.

b. Expansion of plant size with increased community growth

The present plant (1.5 MGD) will serve anticipated growth in the area for perhaps 15 years. It may be easily added on to, when this is necessary.

37. Chuck Perkins 3-23-76

Need for sewage treatment for Delaware County.
Comments noted.

38. Robert J. Golten, National Wildlife Federation 3-26-76

Response: a. Population growth

Existing population is scattered along major roads or in small subdivisions. Future population growth is anticipated in larger clusters, such as PUDs, as well as continuing the present pattern. Part of the growth will be induced by project construction and part will not. Chapter 5, Section C-2 addresses secondary impacts.

b. Floodplain

Flood insurance is discussed in Chapter 1 of both the Draft and Final EIS. Land use aspects are covered in Section C of Chapter 5. Placing the plant above the historic 100 year flood level on a regulated stream will provide flood protection. Other aspects of system reliability are found in Section G of Chapter 5.

c. Nonpoint source pollution

Section C-2 addresses this topic in Chapter 5.

d. Aesthetics

Grant conditions will assure that the mitigative landscaping and architectural measures are followed.

e. Bald Eagle

The status of the bald eagle in Delaware County is clarified in Section F-2 of Chapter 2.

f. Chlorine and ammonia

Chlorine and ammonia have been evaluated in section E-2 of Chapter 4 and also in Appendix H. The plant proposed in the Facilities Plan is already a tertiary one, with phosphorus removal. The Draft EIS proposed an extended outfall to a downstream area of lesser biological value.

39. Donald T. Williams, Chief, Planning Division, U.S. Army Corps of Engineers, Ohio River Division 3-25-76

Response: a. Title

The title of the Draft EIS is consistent with the title of the Facilities Plan.

b. Alum Creek Lake

This has been corrected in the text of the Final EIS.

c. Low Flow

The Waste Load Allocation for the Scioto River was prepared by Ohio EPA. USEPA approved it, based on our best knowledge of low flows at that time. We have used the lower, low flow value in this EIS, whenever possible.

d. Easements

This has been noted in section B-1 of Chapter 3.

e. Permits

This also has been indicated in Section B-1.

f. Water withdrawal

This has been noted in the text.

g. Figure 3-1 and figure 4-2

The sewer illustrations have been revised as much as possible.

40. Edward F. Hutchins and Richard S. McCutchen, Metropolitan Park District of Columbus and Franklin County 3-26-76

Response: a. Resources enhancement and non-degredation

The proposed tertiary facility is designed to enhance water quality in the Olentangy River. Chapters 3 and 4 discuss the engineering institutional aspects of implementing the regional alternatives.

b. Aesthetics

Control of urbanization impacts is discussed in Chapter . The scenic route designation is included in Section J-9 of Chapter 2. Loss of farmland is discussed in Section E-4 of Chapter 5. Except for a portion of the landscaping, the sewage treatment facilities would be above the 100 year floodplain at site OR-3. Purchase of scenic easements would preserve the vast majority of the view.

c. Alternate sites

Site OR-6 and cost estimates are discussed in Chapters 3 and 4. Additional capital costs of this alternative are considerable; only a part of them (about $300,000) could be eliminated by reducing some of the architectural and landscaping features added at site OR-3. Detailed design for this alternative might be able to utilize additional gravity flow. This level of design is beyond the scope of this EIS.

d. Effluent discharge

Reports by Olive (1971) and Olive and Smith (1975) describe the aquatic insects of the Scioto River system. Chlorine and ammonia impacts are discussed in section E-2 of Chapter 4. The chlorine and ammonia limit levels discussed in Appendix H correspond to those in "Water Quality Criteria," 1972. Ohio EPA has certified the Facilities Plan and has issued its discharge permit.

e. Worthington Hills STP

Enforcement efforts are presently focused on larger dischargers than this small facility. In addition, the plant is scheduled for a zero discharge in 1977.

f. Fecal Coliform Counts

The regulations cited apply to 303-e basin planning and to the NPDES permit program, which are both state responsibilities in Ohio. The major upstream point discharge is at the Delaware City treatment plant, for which additional improvements are presently being planned. Septic tanks are non-point sources, and are contributing to a part of the Olentangy bacterial pollution.

g. Population

Section B-1 in Chapter 3 describes the variable involved in extending sewer services. The 6MGD projection is for an ultimate size, beyond the 20 year planning period.

h. Delaware STP

Upsets at this facility are related to industrial waste and to wet weather problems. This proposed facility will have minimal industrial flows and will have a new exclusively sanitary sewer system, so that these types of operation problems will not be present.

i. Interceptors for new communities

An evaluation of funding eligibility will be made on each interceptor, as it is presented to EPA for funding. The interceptor is planned to serve existing homes and the proposed development, as the rest of the sentence indicated. Phase I is presently the only part of the sewer system for which a Step 3 grant application has been made.

41. Philip J. Pollick, Chairman, Clintonville Area Commission,
Columbus 3-29-76

Response: a. Ammonia and chlorine impacts

Additional information on these subjects is given in Section E-2 of Chapter 4 and in Appendix H.

b. Secondary impacts

Sections C-2 and C-3 of Chapter 5 discuss EPA's limited abilities to control secondary impacts and to initiate local land use planning and stormwater management.

c. Floodplain

Placing the facilities above the 100 year flood plain, on a regulated stream, has been used to protect them from flooding. Other aspects of reliability are discussed in section G of Chapter 5. Flood plain zoning is included in the land use discussions.

42. W. Raymond Mills 3-29-76

Response: a. Treatment at Delaware STP

This alternative was eliminated in Chapter 3. Plans are being made to improve the Delaware City facility and its proposed 1977 permit is more strict than the present one. Energy costs for pumping are extensive, and there is a greater chance for breakdown here, than with a gravity system. Additional treatment has been proposed for the Delaware County plant. System costs are discussed in Section C-3 of Chapter 4.

Chapter 4 compares local and regional alternatives. The cost-effective alternative which EPA choses is not always the least expensive one. Additional considerations include environmental and institutional factors.

43. Francis W. Cavanaugh, Manager, Loch Lomond Enterprises,
Worthington 3-26-76

Response: a. Site OR-3

Comments noted. Section C-4 of Chapter 3 indicates the agricultural use of site OR-3.

b. Regionalization

Chapter 4 compares local and regional alternatives.

c. Delaware STP

Improvements for this facility are proceeding separately, with a plan of study under review by EPA.

44. Cynthia D. Barnes 3-25-76

Response: a. Site OR-3

Chapter 5 describes the impacts related to this site.

b. Additional treatment

Sections E-2 of Chapter 4 has re-evaluated this topic.

45. Mary Jo McCaw 3-27-76

Response: a. Recreation resource

The Olentangy is a valuable recreation resource.

b. Park impact

See Sections E-5 and F in Chapter 5 for a discussion of these impacts.

46. John J. and Jane R. Kleber 3-29-76

Response: a. Regionalization

Chapter 3 Section 10 explains why regionalization with Delaware City has been eliminated.

b. Park impact

Section E-5 discusses park impacts in Chapter 5.

47. Ned E. Williams, Director, Ohio Environmental Protection Agency;includes responses from Ohio EPA, the Ohio Department of Natural Resources, and the Ohio Department of Economic and Community Development 4-1-76

Response: a. Water quality requirements

Section E-2 in Chapter 4 discusses ammonia, chlorine and low flows. Low flows are covered in Section E-2 of Chapter 2 as is our rationale for the low flow value chosen for our calculations.

b. Extended outfall

Section G-1 in Chapter 4 presents a discussion of the extended outfall.

c. Secondary impacts

A discussion of secondary impacts and mitigation is in Section C of Chapter 5.

d. Ultimate capacity

This is 6MGD. This EIS addresses only the twenty year planning period, however, which is estimated at 3MGD or less.

e. Short time uses/long term productivity

Chapter 5 addresses this topic both in the Draft and the Final EIS.

f. Percentage of Columbus System capacity

These sections have been rewritten.

g. Industrial pre-treatment

The industrial pre-treatment regulations would apply.

h. Fish species

This information has been corrected in section F-3 of Chapter 2.

i. Ammonia removal

Section E-2 addresses this topic in Chapter 4.

j. Water release

No significant impacts are anticipated. The facilities are located above the 100 year floodplain, and the reservoir is managed for flood control.

k. Landscaping

A mixture of evergreens and deciduous trees has been planned for landscaping at site OR-3.

l. O-DNR approval of sewers

Section B-2 of Chapter 3 notes this requirement.

3. Letters Received After 3-26-76.

#1

9514 Olentangy River Road
Powell, Ohio 43068
March 31, 1976

U.S. Environmental Protection Agency
230 South Dearborn Street
Chicago, Illinois 60604

Attention: Mr. Harlan D. Hirt
Chief, Planning Branch

RE: Olentangy Environmental Control
Center and Interceptor System
Project No. C390698

Dear Mr. Hirt:

As a result of reading the EIS and listening to the comments at the public hearings, it seems that several key points have either been ignored or are in danger of becoming lost in the discussion. It is my understanding that the purpose for all the past and proposed expense is to find the most cost effective method of protecting (or at the very least, stop it's degradation) the environment of southern Delaware County. I am afraid this has become lost.

If we may dispense with the testimony and opinions of the experts (both certified and self proclaimed), there are some practical facts that need to be reaffirmed. Specifically, they are:

1. Concerning the view that we are in danger of spoiling. I fail to understand the esthecic value of an overhead power line and a rather large, but certainly substantiel, erosion ditch which are currently an integral and factual part of that view. Further, I fail to understand how the "beauty" of these two items can be degraded by the proposed plant with all its extras for the sake of scenic beauty.

2. There appears to be a conflict in the EIS concerning the Olentangy's condition and abilities. On one hand, we are told that the effluent from the proposed plant will cause adverse affects downstream of its discharge point. Particular note is made of the high fish population at the ripples at I-270. How is this recouncilled with the current and present discharge from the Worthington Hills plant? This plant is closer to the ripples, it is of comperable size to the proposed first phase, and it provides much less treatment than the proposed plant. The conclusion then seems to be that a much more completely treated effluent from a plant further upstream will somehow be more deadly than the Worthington Hills plant effluent. I am not convinced of that.

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3. It also seems that it is assumed that the Olentangy River will provide no purification downstream of the proposed plant. This assumption doesn't conform to the stream's proven ability downstream of the Delaware City plant.

4. Regardless of whether the proposed plant is installed or not, the population of the southern part of Delaware County will grow. It has grown over the past several years, even with the recession, and there is little reason to suspect that this trend will stop.

5. Conversely, the changes of the population growing enough to require a 4 million gallon plant within 20 years seems remote. This would require 10,000 homes which means 400 new homes per year, assuming that the existing homes connect sometime during the 20 years. This appears to be an over optimistic growth projection for this area.

6. The type and density of housing is determined by zoning, not sewage plants. This is particularly true when the county requires a central system for developments, as Delaware County does. If recent zoning cases are valid indicators, little, if any of the area will be developed with high or medium density housing.

The County is at a crossroads. It can either continue to develop using septic tanks and small one developmental treatment plants, or centralize its treatment facilities. We know from the existing development that, regardless of the theorical possibilities, septic tanks or small aeration units are ineffective. It, therefore, seems wise to develop another method, such as the one proposed.

I do have mixed feelings about the proposed treatment system, because of its cost and because of the lack of evidence of any review of the alternative to use a less centralized system.

Like it or not, money is an endangered species. It's source is limited and once spent cannot easily be recovered. It is neither wise planning or sound management of the environment to spend ten dollars to solve a problem when five dollars would do. For example, the inclusion of the outfall sewer is an added expense, which doesn't improve the ability to produce income. It adds little if anything to the treatment. If the plant's effluent is a problem, its a problem no matter where it is dumped. To move the effluent from Point A to Point B really isn't dealing with the problem.

Page 3
Mr. Harlan D. Hirt
March 31, 1976

I realize that considering a solution that would provide more than one treatment facility goes against the regionalization concept. However, when one looks at the many feet of expensive sewers which would go through or are adjacent to land that won't effectively use them, in addition to the large amount of pumping, it does seem that some review of the cost effectiveness of more than one plant is justified. If this review has been done with the currently proposed plant being the most feasible, then my concern is unfounded.

Briefly summarizing, I find that none of the arguments that have been raised against the project by various groups, individuals, or experts, are logical or consistant with my understanding of the plant's purpose. This system's capability to protect the environment far exceeds the capabilities of the systems being used by the people complaining about it. It's economical feasibility in comparison with the alternative of a less centralized system is the only concern I have which I have not seen discussed.

Very truly yours,

Edward A. Bischoff
Edward A. Bischoff

EAB/km

#2

BUSH COUNTRY FARM
[illegible]
[illegible]

March 29, 1976

U. S. E. P. A. Region 5
230 South Dearborn Street
Chicago, Illinois 60604
Attn: Mr. Harlan Hirt

Dear Mr. Hirt:

As of yesterday we learned of the proposed sewage treatment facility for southern Delaware County, Ohio. As long time residents of the adjacent area in Northern Franklin County we are concerned over this proposal which will continue the destruction of the Olentangy River Valley.

Also, as residents of the specific area known as Mount Air, we are concerned to note an omission in the Environmental Impact Statement draft. There appears to have been no attention given to the fact that the majority of residents of Mount Air obtain our water supply from wells located between the Olentangy River and Route 315, just downstream and south of the county line. The quality of our water could be in jeopardy.

May we request that serious consideration be given to this, as well as to the effect of such a facility on our long established residential area and what remains of the natural beauty of the Olentangy Valley.

Sincerely,

W. Jay and Helen Limbaugh

#3

Valley Utility Company

5481 BUENOS AIRES BOULEVARD
WESTERVILLE, OHIO 43081
[redacted]-4740

March 30, 1976

Mr. Harlan D. Hirt, Chief
United States Environmental Protection
Agency - Region V Planning Branch
230 South Dearborn St.
Chicago, Illinois 60604

Subject: Proposed Sewage
Treatment Plant for
Southern Delaware
County, Ohio
Project #C390698

Dear Mr. Hirt:

Information herein is provided to express our uppermost concern regarding the proposed site of the Southern Delaware County Sewage Treatment Plant.

Valley Utility Company currently provides water service to 860 single family dwellings and 22 commercial businesses in an area known as Worthington Hills. The Southern extremity of the property is located 1/2 mile North of I 270 on Olentangy Road. Three cased wells drilled to a depth of 87' are the sole source of supply. All are located within 150 feet of the Olentangy River at a point approximately one and one-half miles South or downstream from the proposed sewage treatment plant site.

We are primarily concerned that the sewage treatment plant B.O.D. effluent would endanger the quality of the water and in effect create the possibility of contaminating and/or polluting the ground water supply. Also, to be considered are the nutrients and the coliform groups which could influence and be detrimental to the water quality.

Your attention and consideration of the possible effects which might result from locating the sewage treatment plant at this proposed site would be appreciated.

Very truly yours,

L. D. Perry
L. D. Perry
Manager

LDP sl

#4

Environmental Research and Action
1361 Francisco Road
Columbus, Ohio 43220
Director: Von Hill

A Statewide Ad-Hoc Group

March 29, 1976

Mr. Harlan D. Hirt
Chief, Planning Branch
U.S. Environmental Protection Agency
Region V
230 South Dearborn St.
Chicago, Illinois 60604

Dear Mr. Hirt:

Enclosed you will find additional comments for the record on the proposed Olentangy Environmental Control Center, Delaware, Ohio.

Thank you very much,

Von Hill,
Director

Additional comments submitted to U.S. E.P.A., Region V, on the proposed Olentangy Environmental Control Center, March 29, 1974

Errata

Congressman Sam Devine's vote as corrected is:

1. Yes to pass H.R. 11896 (Source: Congressional Record, March 29, 1972, Page 10903).
2. No not to adopt conference report for F.W.P.C.A. 1972 (Source: Congressional Record, October 4, 1972, Page 33767).

Other

As requested by George G. Lashutka, an aide to Congressman Devine, I have submitted my sources as well as where I was in error. The Congressman did in deed vote no not to override the Presidential Veto. The source for this information will be found on page 37061, Congressional Record, October 18, 1972.

We feel the section dealing with attitudes between the counties of Franklin and Delaware and the City of Columbus with regionalization have not been qualified. We urge the U.S. E.P.A. to submit quotes from elected officials of both counties and from Columbus and a poll showing the public's view of the acceptance of regionalization.

#5

Comments concerning the Draft Environmental Impact Statement for the "Olentangy Environmental Control Center" Project No. C390698

1. The existing problem areas won't be served until 1996. One of the first areas to be served will be a vacant field planned for development. EPA regulations stipulate that STP fundings should not be used to promote development.
2. Sewage from Alum Creek and the Scioto watersheds will be treated and released into the Olentangy. The legality of this endeavor should be questioned.
3. The estimated chlorine level at low flow stages is many times the amount considered toxic to aquatic life and will result in the virtual elimination of a recreation fishery listed by U.S. Fish & Wildlife service as "high quality fishery comparable to any in the U.S."
4. Species among those that could be eliminated include six species on the State Endangered Species List.
5. The proposal to pipe the effluent to a point just above Worthington amounts to sweeping the problem under the rug and although it would bypass the area of the most aquatic life diversity would still result in a sterilized river downstream. Upgrading effluent regardless of outfall location is imperative.

Noise:

According to the draft EIS figure 5.4 sound levels audible in the natural area of the park would rank from 57 to 64 decibels or comparable to heavy traffic at 300 feet or a commercial area. These levels are unacceptable and in conflict with the goals of park visitors seeking peace, solitude, and an enjoyable outdoor experience.

Odor:

Quoting Walter J. Cremean, former Columbus director of City Services, "odors from a sewage treatment plant are inescapable. Any mechanical or chemical operation is subject to occasional breakdown. . . regardless of how well designed the plant might be." A study of wind direction at Port Columbus showed the prevailing winds are from the SW 92% of the time and thus would carry the odor directly toward the natural and public use areas of Highbanks Park. These odors would be in conflict with park visitors' goals.

EIS concludes "an accurate determination of the combined effects (of odors) is difficult." In the least a further examination of these effects is warranted

The following is from the EIS:

Impact Summary pages 5-42 and 5-43 of the EPA Draft EIS. Where impacts of the proposed plant are rated adverse or beneficial.

1. Short-term impacts--all eight listed short-term impacts are considered adverse by EPA.

2. Long-term impacts--14 of 22 impacts considered adverse.

It seems as if USEPA is recognizing the tremendous adverse effects and yet condoning them and going ahead with approval.

Alternatives:

Any one or combination of the following alternatives or actions would result in improving or eliminating the aforementioned adverse affects. I officially request that the EPA address, explore, and implement through their finalized EIS and future action on this project some or all of the following:

Consideration and reconsideration of alternatives should be based not solely on economic feasibility but also with respect to total impact on the environment.

Improve existing sewage problems by upgrading present on-lot disposal systems in problem areas. This could be done by partially subsidizing the cost of aeration systems.

Reconsider existing alternative sites. Figure 4.1 of the draft EIS shows eight alternatives with a lower estimated annual cost than site OR-3.

Ohio EPA should initiate action to designate Columbus an area manageable under Section 208 of the Federal Water Pollution Control Act of 1972. This would facilitate regionalization with Columbus. Studies are presently underway to accomplish this.

Consider partial or total treatment of effluent by regionalization with Columbus S. T. plants--Westerville was incorporated into the Columbus system similarily in 1975. Interceptor lines extend to Worthington Hills. Ten to fifteen million devoted to upgrading existing Franklin County facilities would prevent adverse impacts on the Olentangy and could actually improve the presently polluted Scioto.

Concerning regionalization with Columbus the draft EIS on page 4-6 concludes "presently a study of Columbus' existing sewer capacity is underway" and "the most feasible regional alternative would be . . . . . utilizing a force main to transport sewage to Columbus.

However, the EIS cites "extensive legal, economic and institutional arrangements" as a barrier.

I say let's overcome these barriers--the results will be worth it.

In particular I would like to draw attention to an upcoming draft EIS proposed for the Columbus area (USEPA letter dated March 15, 1976 signed by Harlan Hirt) The map attached to this letter shows that portions of Licking, Fairfield, Franklin, and Delaware Counties will be included in the study plan of the sewage facilities of these areas. However, the area of southern Delaware County affected by the proposed STP is not even included in the study area. Under USEPA regulations which require regionalization

I officially request that the funding for Project No. C390598 be withheld pending outcome of the EIS for the Columbus area and that the southern Delaware County area be included in the study plan.

A recent ground swell of public opposition to the proposed project has become apparent. This is not opposition based solely on emotion. Many competent citizens and community leaders have explored the draft EIS and are deplored at the lack of objectivity obvious in several sections.

I am personally requesting the Government Accounting Office to explore the economics of the entire proposed project as the figures used in the Draft EIS for site selection (Chapter 3) are supplied by the consulting engineers who have a vested interest in the selection of site OR-3 as opposed to other alternatives.

This matter has sufficient opposition to be pursued to the full extent of the law and should be if every conceivable alternative is not explored further.

Sincerely,

Gary R. Moore
Gary R. Moore

366 Sunset Dr.
Johnstown, Ohio 43031

#6

DEL - CO
Water Co., Inc.
[illegible] OLENTANGY RIVER ROAD
DELAWARE, OHIO [illegible]
Phone [illegible]

March 29, 1976

Harlan D. Hirt
Planning Branch of U.S.E.P.A.
Region V
230 South Dearborn Street
Chicago, Illinois 60604

Dear Mr. Hirt:

The Del-Co Water Company is very much interested in a cleaner Olentangy River. The water intake is located between Delaware and the Franklin County line or Columbus as most people refer.

We feel most fortunate to have been advised by the Engineering Section of the Ohio Dept. of Health at the time of Del-Co's inception and now better known as the Ohio Environmental Protection Agency to build an upland storage of water supply for our Water Treatment Facilities.

The polluted water pumped from the river to the Lagoon has a chance to take advantage of the sunlight and detention time before it is processed. The Lagoon, however, is slowly becoming polluted from the river water. We constantly have problems with actinomycetes and the chlorine demand is increasing.

We are very much in favor of stopping the dumping of raw sewage on vacant land which ultimately finds its way to the river by means of a network of county tile. Realizing this is done as a last resort because of the lack of sewage treatment facilities.

We are encouraging the USEPA to take positive action in cleaning up the Olentangy River.

Sincerely,

DEL-CO WATER COMPANY, INC.

Robert W. McAdams
Robert W. McAdams
General Manager

RWM/sg

ENVIRONMENTAL PROTECTION AGENCY
RECEIVED
MAR 31 1976
PLANNING BRANCH - Region V

#7

March 28, 1976

Dear Mr. Hirt -

I have just returned from a nature walk at Highbanks Metropolitan Park in Franklin & Delaware counties of Ohio. The guide for the walk told us that there is a proposed sewage treatment plant to be built just west of Highbanks Park. As I read the facts, no good will result from this sewage treatment plant being built in this location. The 300,000 plus gallons of waste to be poured into the Olentangy River will destroy any scenic or pleasant qualities that the river now has. Even if the sewage is piped south of I-270 won't there still be an odor at the plant? Who can enjoy this beautiful nature spot with sewage odor

#8

MARCH 28, 1976

MR. HARLAN D. HIRT, CHIEF
PLANNING BRANCH REGION V
U. S. E. P. A.
230 S. DEARBORN ST
CHICAGO, ILLINOIS 60604

SIR:

DUE TO MY WORK SCHEDULE IT WAS NOT POSSIBLE TO ATTEND THE MEETINGS HELD ON MARCH 16, 1976 CONCERNING THE SEWAGE TREATMENT SYSTEM FOR SOUTHERN DELAWARE COUNTY. I WISH TO ENTER A PERSONAL OPINION.

AS A MATTER OF BACKGROUND, MY RESIDENCE IS NEAR BEAN OLLER ROAD ON STATE RT. 315. FOR THE PAST TWENTY FIVE YEARS I HAVE BEEN IN SCOUTING AND IN NUMEROUS CONSERVATION PROJECTS AND OUTDOOR ACTIVITIES. ALTHOUGH AN ENGINEER BY TRADE I FEATURE MYSELF AS AN AMATEUR HISTORIAN AND BI-PEDAL TRAVELER OF THE OLENTANGY RIVER VALLEY.

BEING AN HONEST SKEPTIC I MUST ADMIT TO BEING UNINFORMEDLY AGAINST ANY FORM OF LARGE SCALE SEWAGE TREATMENT FOR THIS AREA. BUT, AFTER READING THE ENVIRONMENTAL IMPACT STUDY I NOW FEEL JUST AS STRONGLY THAT A CAREFULLY CONCEIVED AND PROPERLY [illegible] FACILITY COULD [illegible] THE [illegible] OF THE VALLEY. BUT, PROTECTION OF ALL LIFE FORMS MUST [illegible] A [illegible].

in the air? I think surely there can be a better location for the plant. Is there possibly some political pressure being exerted onto Delaware & Franklin Co. officials who are for the plant being built? This park is too pretty to be ruined by idiotic political hassling. I hope this letter helps keep the plant from being built in this location or in any other location until it is thoroughly thought out and all problems resolved.

Very truly yours,
Joy E. Niswender
(Joy E. Niswender)
4494 Danforth Road
Columbus, Ohio 43224

WE CANNOT ASSIGN A DOLLAR VALUE TO THE OPEN SPACE AND SOLITUDE NOW PROVIDED BY THIS BIO-SYSTEM. ONE RECURRENT WORRY IS THE FACT THAT FACILITIES BREED POPULATION LEADING TO INCREASED POLLUTION. QUALITY OF LIFE SHOULD BE STRESSED NOT QUANTITY.

MAN AS A SPECIES IS A COMPARATIVE NEWCOMER TO THE EARTH AND EVEN MORE RECENT TO THE OLENTANGY. THOUSANDS OF OTHER SPECIES ARE FOUND IN RESIDENCE AND BY THE STANDARDS OF NATURAL HISTORY MAN HAS JUST ARRIVED UPON THE SCENE BUT HAS ALREADY MADE HIS MARK. SINCE WE ARE MORE OR LESS IN COMMAND OF THE FATE OF MANY OTHER SPECIES, WE; AS THE SELFAPPOINTED CARETAKERS OF THE SPHERE; MUST STRONGLY CONSIDER OUR ACTIONS AND THE EFFECT OF THESE ACTIONS UPON ALL OTHER CREATURES.

DECLARING ALMOST ONE QUARTER OF THE OLENTANGY A "SCENIC RIVER" WAS A FIRST STEP IN PRESERVING ONE OF OUR FEW REMAINING UNSPOILED RIVERS. NECESSARILY, THE FURY OF "PROGRESS" MUST NOT BE BLIND TO THE NEED TO PRESERVE THE FRAGILE ENVIORNMENT OF THIS VALLEY.

CURRENT EFFLUENT STANDARDS WOULD PRESENTLY ALLOW HARMFUL WASTES TO BE RETURNED TO THE RIVER. RESTRICTIONS SHOULD BE TIGHTENED TO THE POINT OF INSURING A SAFE ENVIRONMENT FOR ALL CREATURES RATHER THAN ALLOWING OUR SHORTSIGHTEDNESS TO PROVIDE US WITH A SEWAGE TREATMENT FACILITY AND A RIVER; A MUSEUM; THAT HAS HAD ALL ITS TREASURES DESTROYED.

WITH CAREFUL PLANNING OUR GENERATION CAN BE REMEMBERED AS ONE THAT PRESERVED AND NOT DESTROYED. AS THE ENGLISH POET AND NATURALIST FRANCIS THOMPSON WROTE:

"THOU CANST NOT STIR A FLOWER
WITHOUT TROUBLING A STAR"

THE QUALITY OF OUR EXISTANCE IS INTERWOVEN WITH THE LIVES OF ALL OTHER INHABITANTS OF OUR WORLD.

CONCERNED

William L. Foster
4535 OLENTANGY R. RD.
DELAWARE, OHIO 43015

#9

CHALMERS P. WYLIE
[illegible]

Congress of the United States
House of Representatives
Washington, D.C. 20315

BANKING, CURRENCY AND HOUSING
[illegible]
VETERANS' AFFAIRS
[illegible]

May 17, 1976

Mr. Harlan Hirt
Chief, Planning Board
Region V
U.S. Environmental Protection Agency
230 South Dearborn Avenue
Chicago, Illinois 60604

Dear Mr. Hirt:

In my letter of March 15 to you I detailed my opposition to the site location for the proposed South Central Delaware sewage treatment project (#C390698-01). This letter adds two further points to my earlier correspondence. Criticism of this project has centered around the effluent which would flow from the treatment facility into the Olentangy River across from a major retropolitan park and upstream from densely populated residential areas. One environmental factor seemingly dismissed in the initial E.I.S. but which is of great concern to me is the potential for airborne pathogens.

A 1975 study done by Drs. Martin R. Pereira and M. A. Benjaminson for the City of New York Department of Air Resources identified Bacillus, Flavobacterium, Micrococcus, Streptococcus, and Klebsiella organisms in air samples collected downwind from the test sewage treatment plant. The study, I believe, indicates that microbial air pollution from sewage treatment plants is an environmental factor which should be considered in the case of the Delaware project.

In my earlier letter I suggested a potential solution involving regional cooperation between Delaware County and the City of Columbus. Might it be appropriate for E.P.A. to act as the catalyst to bring about such a joint effort to solve what is certainly a problem of mutual concern?

Your consideration is appreciated.

Very truly yours,

Chalmers P. Wylie
Representative to Congress

CPW:mv

#9

CHALMERS P. WYLIE
[illegible]

Congress of the United States
House of Representatives
Washington, D.C. 20315

BANKING, CURRENCY AND HOUSING
[illegible]
VETERANS' AFFAIRS
[illegible]

June 7, 1976

Mr. George R. Alexander, Jr.
Regional Administrater
U.S. Environmental Protection
Agency
Region V
230 South Dearborn Street
Chicago, Illinois 60604

Dear Mr. Alexander:

Thank you for your reply of June 3rd to my letter of May 17th following-up my initial inquiry of March 15th protesting the South Central Delaware County sewage treatment project (#C390698-01).

Could you please give me an idea as to when we can anticipate the final EIS report being made available? I look forward to your comments on the suggestion involving a potential solution through regional cooperation between Delaware County and the City of Columbus with EPA acting as the catalyst to bring about such a joint effort.

Your attention to this inquiry is appreciated. I have many constituents pressing me for "answers".

Thank you.

Very truly yours,

Chalmers P. Wylie
Representative to Congress

CPW:f

#10

Rl-661

State of Ohio
Office of the Attorney General

William J. Brown
Attorney General

Robert H. Olson, Jr.
First Assistant Attorney General
Maryann Baker Gall
Chief Counsel
G. Duane Welsh
Executive Assistant Attorney General
P. Michael DeAngelo
Deputy Attorney General

June 28, 1976

Alvin Leibling, Esq.
Assistant Regional Counsel
Region V, U.S.E.P.A.
230 South Dearborn
Chicago, Illinois 60604

Re: Proposed Olentangy Environmental Control Center, Draft EIS Project No. C 390698

Dear Sir:

In our recent telephone conversation, I indicated that our office had undertaken a study of Ohio law relating to the manner by which Delware County might avoid construction of the proposed Olentangy Environmental Control Center through agreement with the City of Columbus for the latter to accept and treat domestic wastes generated in southern Delaware County. Enclosed is a memorandum prepared by Ms. Malone which concludes that ample statutory authority exists for implementation of such a "Columbus alternative."

Because of the concern expressed by various governmental entities, private groups and individual members of the community regarding the proposed sewage treatment plant, this office has undertaken a review of the project. It is our feeling, at this time, that the adverse affect that the project would have upon the Olentangy River and adjacent lands is such that a "Columbus alternative" is deserving of serious consideration. Such an alternative has the advantage of preserving the Olentangy, and can be achieved at equal or lesser cost than the building and operating of the proposed plant over the twenty year planning period. Moreover, channelling wastes from Delaware County to Columbus is consistent with the goal of the Water Pollution Control Act to promote regionalization of waste treatment with resultant minimization of the number of separate treatment facilities. We commend to your consideration the withholding of funding to the proposed plant in order to divert the activity of Delaware County officials toward a preferable regional alternative.

Please call or write if we can be of further assistance. Thank you for your attention to this matter.

Yours truly,

David E. Northrop

David E. Northrop
Assistant Attorney General

DEN/jh
Enclosure

#12

Delaware County Engineer

50 CHANNING STREET
DELAWARE, OHIO 43015
TELEPHONE [illegible]

FRED L. STULTS
[illegible]

May 25, 1976

U. S. Environmental Protection Agency
Region Five
230 South Dearborn Street
Chicago, Illinois 60604

Attention: Mr. Henry Longest [illegible] 6/3/76

Re: C390698-010

Gentlemen:

Enclosed are further comments in regards to the Draft EIS and the public hearing held on March 16, 1976 concerning the Olentangy Environmental Control Center and interceptor sewers.

We also wish to point out that a misconception has occurred in regards to the wording used in the Draft EIS regarding the proposed system. The Draft EIS refers to this as the "local" alternative and tends to implant the concept of a non-regional solution to a casual reader of the document. We hereby request that the reference in the Final EIS to the proposed system be changed to the "local regional" solution.

As indicated in previous correspondence, the table on page 4-5 of the Draft EIS should be modified to show true cost-effective analysis, ie. feasible alternatives should be shown separately from those which are not, or the additional cost included with the non-feasible solutions to make them viable alternatives.

Yours very truly,

FRED L. STULTS, P.E.
SANITARY ENGINEER

Gary W. Gilbert
GARY W. GILBERT, P.E.
ASSISTANT SANITARY ENGINEER

GWG:bmh

Comment: The solution to the southern Delaware County sewerage problem should be a comprehensive metropolitan areawide sewage system. (Regionalization - Regional Plan)

Response: The Olentangy Environmental Control Center and interceptor sewer system is a regional solution to the pollution problems of southern Delaware County.

The interceptor sewer system and treatment plant will initially serve the following existing developments:

Highland View Subdivision (3)
Burn Brae Subdivision
Nationwide Training Center
Swan Rubber Company
Retreat Subdivision
Highbanks Metropolitan Park
Adams Addition
Birds Subdivision
Lenview Subdivision (2)
Bush Additions (3)
Clouse Addition
Culbertson Subdivision
Colonial Meadows Subdivision
Hoovers Africa Road Subdivision
Indian Run Estates
King Lee Subdivision (2)
Leyland Subdivision
[illegible] Subdivision
Noble Subdivision
[illegible] Subdivision
[illegible] Terrace (2)
Eureka Industrial Park
Keno [illegible] Additions (3)
[illegible] Subdivision
Scotch Pines (3)
Timberlane Subdivision
Ward Subdivision
White Addition Subdivision

Also, later it will serve the following existing developments:

Village of Powell
Village of Shawnee Hills
Village of Lewis Center
Westchester Subdivision
Pleasant Corners Subdivision (2)
Hawthorne Valley (3)
Knoll Subdivision
Jardir Estates
Scioto View Subdivision (2)
Lakeview Estates Subdivision (4)
Lee-View Subdivision
Ruckmoor Subdivision
Osage Acres Subdivision (5)
Pickering Subdivision
East Orange Subdivision
[illegible] Acres
[illegible] Subdivision (2)
Orange Ridge Subdivision
Flory Subdivision
Clay C. Darnell Subdivision

Midway Gardens Subdivision (2)
Riverview Heights Subdivision
Idle Acres Subdivision
Olentangy Cliff Subdivision
Spring Hills Subdivision
Rutherford Road Subdivision
Sunset Cove Estates Subdivision (2)
Grace & Harry Jones Subdivision (2)
Woodview Acres Subdivision (2)
Kobe Subdivision
Liberty Acres Subdivision (2)
Tall Oakes Subdivision
Lester Subdivision
Bridlespur Subdivision
Twin Lake Addition Subdivision
Section Estates Subdivision (3)
Rocky Meadows Subdivision
Dairy Hill Subdivision
Lake Hill Estates Subdivision (2)
Elmgee Addition Subdivision (3)
Thompson Subdivision
Hilands Heits Subdivision (2)
Riverside Estates Subdivision
Almar Acres Subdivision
Ebrights Scioto Subdivision
Eagle Subdivision
Belle Vista Subdivision
Old Trail Addition Subdivision
Mesloh Subdivision
Cardinal Park Subdivision (5)
Gardner Subdivision
Reesland Subdivision (3)
Wyandotte Springs Subdivision
Brookwood Subdivision
Tippecanoe Subdivision
Sawmill Estate Subdivision
Maxine Lakes Subdivision
Seldom Seen Heights Subdivision (2)
Bunty Acres Subdivision
Stonebury Subdivision (2)
Schmidts Subdivision
Jerome Subdivision
Warren Acres Subdivision
Scioto Hills Subdivision
Bricker Subdivision
Yorkland Subdivision
Healy Subdivision (2)
Jay-Ban Subdivision
Rolling Acres Subdivision
Kilbury Estates Subdivision
Thompson Acres Subdivision
Thomas Hills Subdivision (2)
River Terrace Subdivision
Concord Meadows Subdivision (2)
Sundown Acres Subdivision
Kenneth Thomas Subdivision
Welch Subdivision
Alumwood Subdivision
Denton Subdivision
Orangewick Subdivision
Southview Acres Subdivision
Tall Pine Acres Subdivision (2)
Alum Glen Subdivision
Hollenback

NOTE: Number in parenthesis indicates number of phases in development.

The interceptor system will further provide interceptor sewers to collect wastewaters which are currently discharged into the Alum Creek Reservoir and O'Shaughnessy Reservoir. The system will serve an estimated 60,000 people ultimately, thus providing a regional comprehensive areawide sewerage system for southern central Delaware County.

If the wastes from southern Delaware County are discharged to the City of Columbus system, then waste treatment problems and water quality violations in the streams below Columbus will be compounded. With the projected loadings for the Columbus wastewater treatment plants and the proposed advanced waste treatment, the Scioto River below Columbus will not meet water quality standards at all times.

As stated in the draft copy of the Environment Assessment of the Columbus Metropolitan Area Facilities Plan for the City of Columbus, December 1977. "The Scioto River receives the largest loads of industrial and municipal wastes of any of the streams within Franklin County. The worst pollution problem in the Scioto Basin is in that segment of the River below Columbus, where, at low flow, polluted conditions exist as far as 50 miles downstream from the City. This portion of the River is so degraded and the volume of discharges so great that even after the application of Best Available Treatment (as defined by OEPA), it is considered unlikely that water quality standards will be met. At best, rather than a 40 or 50 mile reach of grossly polluted water, the Scioto would be able to fully recover in approximately 13 miles below the Jackson Pike Sewage Treatment Plant". (Emphasis added)

Regionalization is desired to the point of maintaining water quality. In other words, water quality problems are encountered whenever the waste load discharged at any given point on a stream exceeds the stream assimilative capacity. Adding highly treated wastewaters to streams at various points can be more beneficial than concentrated loads from large areas. The extent of regionalization should not continue to the impairment of water quality in all streams. Regionalization of the Columbus system has occurred to its maximum point. Further, regionalization prohibits the attainment of water quality standards at all times based on existing technology. Discharging highly treated effluent upstream of Worthington would tend to have a beneficial effect below Columbus.

FMS:pr
3/21/76

Comment: Opposed to construction of the extended outfall sewer as proposed in the Draft EIS to south of I-270. A few of those expressing opposition to the extended outfall sewer are as follows: Ohio EPA, City of Columbus, City of Worthington, Mr. Patrick Dugan, and Mr. John Schmutte.

Response: Delaware County is also opposed to the construction of the extended outfall sewer and expressed this by letter to the U.S. EPA. This letter included the various physical constraints, erroneous Olentangy River low flow data, and greater cost estimate than included in the Draft EIS.

Comment: The Draft EIS does not [illegible] research the use of scattered [illegible] permanent plants.

Response: Scattered small permanent or package systems have a history of poor operation and maintenance. (Ref. Ohio EPA Scioto Basin 303(e) continuing planning process, Draft Wasteload Allocation Report [illegible]

Numerous small permanent treatment systems would involve duplication of equipment, duplication of manpower with the smaller units receiving only periodic attention to operation and maintenance, and would also involve more costly expansions and additional costs of duplication when treatment requirements are increased. Even more critical in regards to our present energy situation is the additional energy requirements needed to operate smaller inefficient mechanical devices and equipment. Adequately monitoring the degree of treatment of every individual plant operation to insure compliance with effluent requirements would be impractical.

Comment: Toxic levels of ammonia and chlorine.

Response: Ohio E.P.A. has adequately addressed the toxicity levels in their analysis and computer simulation of the Olentangy River.

Comment: What is the yearly cost of operation?

Response: As shown on pages X-7 and XI-4 of "The Sanitary Sewerage Facilities Plan for South-Central Delaware County, Ohio", the annual estimated operation and maintenance costs range from $94,000/year for year #1 to $158,000/year for the 20th year, based on 1974 estimates.

The Draft EIS does not show the costs (including operation and maintenance) for the local regional alternative as it does for all of the sub-alternatives. These are included, however, on pages 51 and 52 of the report by Enviro Control. Totaling the operation and maintenance costs for the 1.5 mgd phase of the plant and the phase one operation and maintenance costs for the interceptor sewers yields a figure of $408,470/year. Based on the data for operation and maintenance costs in the Facilities Plan, the above figure appears to be extremely high.

Furthermore, past experience by other counties involved with these scattered small systems have led them to phase these out as a centralized system has become available. In particular, numerous wastewater treatment plants within Franklin County, Ohio have been taken out of service in recent years and the U.S. EPA is presently funding additional interceptor sewers for the elimination of small wastewater treatment plants within Franklin County. One of significance is the elimination of the Brookside Estates wastewater treatment plant discharge to the Olentangy River near S.R. 161. The Worthington Hills wastewater treatment plant discharge to the Olentangy River is also being planned for elimination.

Comment: The proposed Olentangy Environmental Control Center would be adjacent to a six million dollar investment in a public recreation and natural area (Highbanks Metropolitan Park).

Response: The 1975 Annual Report of the Metropolitan Park District - Columbus and Franklin County shows a total investment of $2,590,830.33. See attached financial report.

Comment: Audible sound levels (from the Olentangy Environmental Control Center) in the natural area of Highbanks Park would range from 57 to 64 decibels (1,000 to 2,000 feet from source).

Response: From the report "Compatibility Factors of a Proposed Delaware County Sewage Treatment Plant with the Highbanks Metropolitan Park" - Preliminary Final Report dated August 15, 1973, prepared by Battelle Columbus Laboratories for the Metropolitan Park District of Columbus and Franklin County, the following is quoted:

"Limited noise measurements made at the park site, together with the results of measurements made in similar areas, indicate that the background or ambient noise level in the park ranges from 35 dBA to 45 dBA." This agrees with published values for rural noise levels.( ) A measurement made in the park, approximately 300 meters from the west perimeter, yielded an ambient noise level of 42 dBA. Calls of a nearby bird raised to level temporarily to 52 dBA. At the point where the measurement was obtained, there was a heavy stand of immature softwood trees and dense undergrowth. The wind was blowing at a speed of approximately 5 kilometers per hour (3 mph), producing a slight rustling sound in the trees. A small amount of noise from vehicular traffic could be heard." (Emphasis added)

In late 1975, sound level readings were made at the following wastewater treatment plants, utilizing a General Radio Co., Type No. 1565-9015, Type 2 ANSI S1.4-1971 (A-Scale):

Somerset, Ohio 0.25 mgd
  Positive displacement blowers - outdoors
  50 ft. - 73 Decibels
  200 ft. - 56 Decibels
  800 ft. - less than 50 Decibels - could not hear blowers

Oberlin, Ohio 2.3 mgd - Single stage - 3 blowers
  Centrifugal Blowers - inside brick building
  Readings taken with windows open
  5 ft. outside of window - 87 Decibels
  50 ft. - 71 Decibels
  200 ft. - 56 Decibels

Waverly, Ohio [illegible] mgd - Single stage - 2 blowers
  Centrifugal Blowers - inside brick building
  Readings taken with windows open
  50 ft. - 76 Decibels
  200 ft. - 54 Decibels

McConnelsville, Ohio [illegible] mgd - Single stage - 3 blowers
  Centrifugal Blowers - inside brick building
  Readings taken with windows and doors closed
  50 ft. - 66 Decibels
  200 ft. - less than 50 Decibels

These buildings are of block with brick veneer without vegetation or topographic screening. Distance, vegetation, and topography, including hills and walls, can reduce noise levels significantly.

The nearest point of Highbanks Park is approximately 1,000 feet from the mechanical equipment of the proposed wastewater plant. It can readily be seen that based on the dissipation law of sound pressure and the topographic and vegetation barriers included in the design along with the natural features will result in sound levels significantly below 55 decibels.

In the "Environmental Assessment of the Olentangy Environmental Control Center A Proposed Wastewater Treatment Plant for Delaware County, Ohio", dated July, 1973, the following is quoted from page 23:

> "It is expected that noise levels caused by operation at peak times (6-9 am and 5-12 pm) would be compatible with that of a quiet residential street, in the range of 40-45 decibels."

Comment: Low cost sanitary sewer system will stimulate secondary growth.

Response: It has been demonstrated elsewhere in this data that the total charges for sanitary service to new homes (capacity charge and house service) are comparable to an approved septic system. These costs for Delaware County are considerably higher than comparable charges in Franklin County (Columbus); consequently, it should encourage development in sewered areas of Franklin County before stimulating any secondary growth in Delaware County.

Further discussion on the subject of secondary (future) growth was included under the response to Comment No. 2 of the "Response to U.S. EPA - Region V Question of October 22, 1974."

Comment: Airborne pathogens will present a significant health hazard.

Response: From an article titled, "Disease Risks of Occupational Exposure to Sewage" which was published in the April, 1975 Journal of the Environmental Engineering Division of the Proceedings of the American Society of Civil Engineers the following is quoted from the attached article:

> "Airborne Infections - A number of recent studies have been addressed to the airborne bacterial levels adjacent to sewage treatment plants. However, no correlation has been made between specific organism level and incidence of disease."

#13

Delaware County Engineer

FRED L. STULTS

June 17, 1976

United States Environmental Protection Agency
Region Five
230 South Dearborn Street
Chicago, Illinois 60604

Attention: Mr. Henry L. Longest II, P.E.

Re: Delaware County, Ohio
C390698 010

Gentlemen:

Enclosed are our comments and discussion of items number two and four of the NERL conclusion/recommendations.

We anticipate mailing copies of the Franklin County Common Pleas Court decision regarding the Scenic Rivers law and of the enacted legislation relative to requiring connections to county sewers the first of next week.

Yours very truly,

FRED L. STULTS, P.E.
SANITARY ENGINEER

GARY W. GILBERT, P.E.
ASSISTANT SANITARY ENGINEER

GWG:bmh

Enclosures

76 JUN 21 AM 11:54
MGT. DIV. - GAB

EXPENDITURES	BLACKLICK WOODS[1]	BLENDON WOODS	DARBY CREEK	HIGHBANKS	SHARON WOODS	CHESTNUT RIDGE	SLATE RUN	INNISWOOD	BECK FOREST	TOTAL ALL PARKS	CENTRAL OFFICES	GRAND TOTAL
General Planning[2]	$ 5,077.92	$ 5,077.92	$ 5,077.92	$ 5,077.92	$ 5,077.92	---	$ 5,077.92	$ 5,077.92	---	$ 35,545.44	---	$ 35,545.44
Land Purchase	---	---	42,410.75	---	47,200.00	84,359.04	17,900.00	200.00	152,301.51	327,[illegible].50	---	[illegible]
Roads, Trails, Parking[3]	88,971.51	---	---	442,590.77[4]	102,571.63[5]	---	7,5[illegible]	56.50	---	[illegible]	---	[illegible]
Misc. Development	10,234.72	39,573.85	8,351.71	37,073.62	9,256.03	83.11	5,473.95	9,611.41	1,324.54	120,[illegible].74	8,031.02	132,6[illegible]
Permanent Planting	22,032.1[illegible]	1,[illegible].93	665.11	10,277.19	4,796.13	12.36	57.68	424.00	---	44,[illegible].10	---	[illegible]
Building Construction	[illegible]	31,0[illegible].46	---	81,514.94	7,791.93	---	---	1,830.00	---	152,[illegible].04	---	152,[illegible]
Furnishings-Equipment	---	---	---	---	---	---	---	---	---	---	---	---
Utilities[6]	23,723.13[7]	323.44	---	8,570.14	35.60	---	---	---	---	37,5[illegible].37	---	[illegible]
Water Impoundment	627.00	---	---	---	---	---	---	---	---	627.00	---	[illegible]
Total Investment (1976)	$ 195,897.47	$ 77,617.79	$ 56,505.69	$ 588,708.58	$ 258,729.90	$ 84,454.51	$ 37,633.24	$ 17,202.03	$153,326.05	$ 1,448,225.07	$ 8,031.02	$ 1,45[illegible]
Accum. Investment	$3,403,165.31	$1,855,811.10	$782,829.02	$2,436,696.07	$2,246,156.29	$558,907.11	$1,032,010.76	$213,901.51	$153,337.75	$12,706,0[illegible].12	$104,608.35	$ [illegible]
Acreage Acquired (1976)	---	---	8.889	---	1.000	---	23.352	---	300.690	333.931	---	333.931
Accum. Acreage	628.336	645.981	368.778	1,049.637	760.873	437.836	1,631.132	35.600	1,459.630	7,021.274	---	7,021.274
Attendance (1974)	484,188	342,114	271,137	180,671	173,320	---	3,613	---	---	1,461,049	---	1,461,04[illegible]
Accum. Attendance	5,494,407	5,415,894	2,820,811	232,548	823,177	---	9,128	---	---	14,555,657	---	14,555,65[illegible]

1 Includes Blacklick Woods Golf Courses.
2 Includes all charges on ADM-2-1 and divided between Blacklick, Blendon, Darby, Highbanks, Sharon, Slate Run, and Inniswood.
3 Includes State Highway Allocation Funds used: $88,800.00 at Blacklick Woods; $38,500.00 at Sharon Woods.
4 Includes Phase II area construction.
5 Includes construction of 3.8 mile bicycle trail, two bicycle trail bridges.
6 Includes utility construction: water, electric, sanitary, gas.
7 Includes construction of 26" x 160' well on golf course.

1975

EXPENDITURES	BLACKLICK WOODS[1]	BLENDON WOODS	DARBY CREEK	HIGHBANKS	SHARON WOODS	CHESTNUT RIDGE	SLATE RUN	INNISWOOD	BECK FOREST	TOTAL ALL PARKS	CENTRAL OFFICES	GRAND TOTAL
General Planning[2]	$ 7,425.63	$ 7,425.63	$ 7,425.63	$ 7,425.63	$ 7,425.63	---	$ 7,425.63	$ 7,425.63	---	$ 51,979.41	---	$ 51,9[illegible]
Land Purchase	---	---	---	123.50	7.55	78,553.20	---	131,232.37	14,233.45	214,149.27	---	214,1[illegible]
Roads, Trails, Parking[3]	26,087.81	---	---	21,330.83	35,834.19	---	---	---	---	83,2[illegible]	---	[illegible]
Miscellaneous Development	8,312.[illegible]	19,551.53	1,348.09	30,362.45	33,690.63	1,325.28	3,536.57	14,008.12	873.01	[illegible]	---	[illegible]
Permanent Planting	5,2[illegible].71	2,429.91	640.51	16,977.33	5,003.84	---	802.03	831.23	---	34,[illegible].59	---	[illegible]
Building Construction[4]	13,0[illegible]	108,[illegible].53	---	34,963.00	5,857.32	---	10,636.39	---	---	179,[illegible].06	---	[illegible]
Furnishings, Equipment	835.00	---	---	---	---	---	---	---	---	[illegible].00	---	[illegible]
Utilities[5]	8,056.63	2,979.64	---	41,388.93	311.44	---	388.30	---	---	52,[illegible].06	---	[illegible]
Water Impoundment[6]	8,647.79	---	---	---	---	---	---	---	---	8,[illegible].70	---	[illegible]
Total Investment (1975)	$ 77,612.30	$ 138,355.34	$ 18,833.83	$ 152,123.08	$ 88,236.60	$ 79,777.40	$ 31,857.00	$164,417.35	$ 14,813.38	$ 738,017.30	---	$ [illegible]
Accum. Investment	$3,400,557.81	$2,099,077.34	$803,153.15	$2,590,830.33	$2,334,392.89	$630,804.57	$1,064,307.76	$200,399.06	$108,450.31	$12,534,0[illegible].42	$104,608.35	$ [illegible]
Acreage Acquired (1975)	---	---	---	---	---	11.706	---	14.030	---	25.743	---	25.7[illegible]
Accum. Acreage	632.306	645.981	368.778	1,049.637	758.855	445.803	1,637.192	33.830	1,430.600	7,117.017	---	7,117.0[illegible]
Attendance (1975)	512,920	306,022	261,881	215,188	183,484	---	1,038	---	---	1,485,384	---	1,485,38[illegible]
Accum. Attendance	6,000,337	5,081,018	2,782,199	447,858	1,168,681	---	16,187	---	---	16,279,931	---	16,279,9[illegible]

1 Includes Blacklick Woods Metropolitan Golf Courses.
2 Includes all charges on ADM-2-1 and divided between Blacklick, Blendon, Darby, Highbanks, Sharon, Slate Run, and Inniswood.
3 Includes completion of 2.2-mile bicycle trail construction in Sharon Woods.
4 Includes approximately $98,000.00 for construction of new Mechanics Building in Blendon Woods.
5 Includes installation of water line system for Phase II picnic area in Highbanks.
6 Pond construction for new interpretive center in Blacklick Woods.

2. Effluent Disinfection

As an extension of the discussion on the use of Ozone, we offer the following:

a. On page 6 of the MERL Conclusions/Recommendations, it appears that for 1.5 MGD plant, the treatment costs per Ozonation are 1.066 times the chlorination alternate cost. Based on the attached article "What's Best for Disinfection", Water & Wastes Engineering, May, 1976, the treatment costs for Ozonation are 1.563 times the chlorination alternate cost (2 MGD plant). Contrary to the conclusion reached on page 6, the cost differential is not of a "relatively small magnitude".

b. Ozone treatment does not produce a chemical indicator which can be measured in order to judge the degree of disinfection. The membrane filter technique (standard methods) for the quantitative measurement of fecal coliform organisms requires a 24 hour incubation period. Therefore, insufficient disinfection of water-borne organisms could persist for this period of time.

c. It must be recognized that the use of Ozone does not eliminate the hazards involved with the disinfection process. The following is quoted from an article titled, "Broadcast of Microbial Aerosols by Stacks of Sewage Treatment Plants and Effects of Ozonation on Bacteria in the Gaseous Effluent", pages 6-32 thru 6-36 of the Draft EIS:

> "It is of particular interest, in the light of findings of Zelac and co-workers (19) that inhaled ozone can cause chromosome breaks in circulating lymphocytes in vivo, that several sewage treatment plants presently under construction in New York City will employ ozone as a deodorant. The roof of one plant will be used for recreational activities, and the entire complex is located in a densely populated residential area (20). Research is urgently needed to determine how far ozone will travel downwind and still be reactive". (Emphasis added)

d. At the present time, we are not aware of the availability of performance data on the use of Ozone disinfection for full scale wastewater plants. However, we understand that there are several wastewater plants utilizing Ozone disinfection currently starting operation. Until performance data on these plants is available, it must be presumed that the installations are experimental. If this alternate becomes a recommendation or requirement, it is presumed that the Environmental Protection Agency will assume the responsibility for its use.

4. Covering of Aeration Tanks and Scrubbing of Exit Gas

a. The Summary of the MERL Conclusions/Recommendations regarding Covering of Aeration Tanks and Scrubbing of Exit Gas, is as follows:

> "No relevant information on the type device to be employed, the capital and operating cost, or the efficiency of such a technology exists. A crude approximate capital cost is provided for a two stage air filtering system". (Emphasis added)

Further, concerning the scrubbing of exit gas it was noted in the report that filtration would probably be satisfactory and scrubbing unnecessary.

b. It appears from the data reported by Benjaminson and Pereira (Draft EIS pages 6-32 thru 6-36) that some bacteria become airborne from aeration systems. It was also shown that ozone disinfection of the stack gas (scrubbing) had very little, if any, effect on their viability. They also indicated that these particles were in the 2.0 to 5.5 millimicron range. Thus, filtration as described in the MERL Report would probably not remove any of the particles of this size. Benjaminson and Pereira also reported 21,000 colony forming units within the aeration building, as compared to approximately 48 colony forming units 300 meters downwind. Thus, if any environmental health problem is created by these particles, it should immediately show up in wastewater treatment plant operations personnel. Other studies have not shown this to occur.

From the above considerations, it can be seen that scrubbing and filtration would have little or no effect on the exit gas and that containment (covering the tanks) of the gas would thus have no beneficial purpose.

c. Presently, there are no known proven environmental health reasons to cover wastewater treatment plant aeration systems. Therefore, it is presumed that any consideration of this type would be for research, experimentation and/or demonstration reasons.

d. The proposed wastewater treatment facilities are located such that they are well isolated. The attached aerial map indicates the location for these facilities.

e. We conclude these comments by noting that by letter of March 25, 1976, the Department of Health, Education and Welfare, Region V, stated the following as their comments on the Draft Environmental Impact Statement - Olentangy Environmental Control Center and Interceptor System - Delaware County, Ohio:

> "To our knowledge, and based upon the information provided, this project will not impact to any significant degree on the health, education or welfare of the population". (Copy attached)

DISINFECTION using chlorination-dechlorination-post aeration won out over various other treatment alternates in a study to determine the best method to achieve effluent quality goals at a 2.0 mgd wastewater plant.

Numerous treatment techniques, both chemical and nonchemical, are available to achieve disinfection of the water. Strong oxidizing chemicals used for this purpose include the halogens such as chlorine, bromine, fluorine, and iodine, hypochlorites, chlorine dioxide, hydrogen peroxide, potassium permanganate, and ozone. Nonchemical methods of disinfection include heat treatment, and application of high-frequency irradiation with ultraviolet light, and gamma and X-rays. Chlorine and ozone are, by far, the most commonly used disinfectant in the field of municipal water supply and wastewater treatment. Large scale use of other disinfection methods is limited for economic and/or practical reasons.

As mentioned earlier, in case chlorine is used for effluent disinfection, limiting residual chlorine concentration to 0.5 mg/l, at all times, is also required to meet the effluent standards. Excess residual chlorine can be controlled by various means, such as the application of reducing chemical compounds, by aeration with proper pH adjustments, or by an activated carbon system.

Removal of excess chlorine by aeration is not a very effective method. Its effectiveness decreases with an increase in pH, due to the formation of hypochlorite (OC1−) ion which is nonvolatile. The activated carbon system would require a high degree of pretreatment for controlling the suspended solids and, therefore, would not be economical for the conventional secondary treatment plants. The chemicals employed most commonly to remove excess chlorine are: Sulfur dioxide (SO_2); sodium sulfite (Na_2SO_3); sodium bisulfite ($NaHSO_3$); and sodium thiosulfate ($Na_2S_2O_3$). Of those reducing chemicals, sulfur dioxide is by far the most practical and economical chemical for reducing the chlorine. The sulfonator and SO_2 feeding equipment for dechlorination are similar to the chlorination facilities. Since the addition of Cl_2 and SO_2 to water produces acid as a by-product of chemical reactions, pH adjustment may be necessary prior to discharge of effluent having low buffering capacity. Post-aeration would follow chlorination-dechlorination to produce effluent with sufficient dissolved oxygen concentrations.

Ozone has been successfully employed for disinfection in the domestic water supply field, especially in Europe. Large scale application of ozone in the municipal wastewater treatment field is, however, limited at present. There are few communities that have selected the ozone disinfection method for wastewater.

Ozone (O_3) is a very strong but unstable oxidizing gas. Reaction of ozone with the pathogenic microorganisms is instantaneous and very effective. Ozone is produced on site by passing either air or pure oxygen through a field of high electric potential which transforms oxygen molecules into ozone molecules with a higher oxidation potential. The generated gas contains approximately 1.0% ozone by weight if air is used, and 2.0% ozone by weight if pure O_2 gas is used. In a typical installation, ozone is mixed with the wastewater in a closed contactor equipped with baffles for mixing, and vent for disposing of or for recycling excess gas containing a high fraction of oxygen to the ozonator.

Based on the above discussion, the two most practical treatment alternatives were selected for detailed evaluation. These are: (1) the chlorination-dechlorination-post aeration system (Alternate A), and (2) the ozonation system (Alternate B). A detailed cost analysis of these two alternative treatment systems is presented below for a 2.0 mgd biological [illegible]

What are the costs?

In preparing a rational cost-effective analysis of alternatives, the parameters included in such an evaluation must be uniform for comparison. In general, the factors which influence the process design and capital and operating and maintenance costs are: (1) the degree of wastewater treatment provided prior to disinfection (e.g., primary, secondary or tertiary), which in turn may be used to determine the necessary chemical dosage and [illegible] treatment facility; (2) the [illegible] standards; (3) selection [illegible] of the construction materials and process equipment; (4) the [illegible] source of the cost data; and (5) the size of the treatment plant.

The cost-effective analysis presented herein was prepared in mid-1975 for a secondary wastewater treatment plant (average design flow = 2.0 mgd; peak flow = 4 [illegible]) [illegible] effluent suspended solids [illegible] from 30 mg/l (mean of 30 consecutive days) to 45 mg/l (mean of [illegible] consecutive days). The [illegible] be discharged into a [illegible] which is classified for [illegible] use, public, industrial and [illegible] water supplies, and warm water fishery. The cost [illegible] presented herein [illegible] accordance with the U.S. EPA [illegible].

Following the selection of the two most practical treatment alternatives, i.e., Alternate A: Chlorination-dechlorination-postaeration, and Alternate B: Ozonation, each treatment unit was sized using the process design criteria presented in Table 1. Next, the process and auxiliary equipment were selected and a preliminary layout of the treatment facility was prepared for estimating the capital cost of each alternate. The sizing of each treatment unit is shown in Table 2 for each alternate.

Construction cost of each alternate was estimated under two main categories: (1) Structures and (2) [illegible]

Messrs. Gusts and Sutton are process engineer and vice president, respectively, Havens & Emerson, Cleveland.

1—PROCESS DESIGN CRITERIA

Alternate A: Chlorination-Dechlorination-Post Aeration

1. Chlorination contact time,	15 minutes at peak flow
2. Dechlorination contact time,	5 minutes at peak flow
3. Post-aeration time:	15 minutes at peak flow
4. Average chlorine dose:	8 mg/l
5. Average SO_2 dose:	One part per part residual chlorine
6. Average D.O., after post-aeration:	6 mg/l

Alternate B: Ozonation

1. Ozonation contact time,	5 minutes at peak flow
2. Average ozone dose*:	6 mg/l

---

*For secondary effluent containing S.S. varying from 30 to 45

2—SIZING OF TREATMENT UNITS

Alternate A:

Chlorination-Dechlorination-Post Aeration

1. Chlorine contact tank:	15' wide 25' long, and 15' sidewater depth (SWD)
2. SO_2 contact tank	15' wide, 8' long, and 15' SWD
3. Post aeration tank	15' wide, 25' long, and 15' SWD

Alternate B: Ozonation

1. Ozone contact tank (Enclosed):	10' wide, 18' long, and 18' SWD

3—ESTIMATES OF CAPITAL COST
(1975 Price Level)

Item	Alternate A: Chlorination-Dechlorination-Post-Aeration	Alternate B: Ozonation
1. Structures	$ 98,000	$ 35,000
a. Structures	88,000	27,000
b. Yard work	5,000	7,000
c. Contingency	5,000	1,000
2. Process and auxiliary equipment	$ 63,000	$298,000
a. Process and aux. equipment	41,000	254,000
b. HVAC and plumbing	12,000	3,000
c. Electrical, instrumentation & controls	6,000	25,000
d. Contingency	3,000	19,000
3. Total initial construction cost, (item 1 + 2)	$161,000	$333,000
4. Salvage value (Yr. 1995) of structures	$ 59,000	$ 13,000
5. Present worth (Yr. 1975) of salvage value, (@ i=7%, n=20 years)	$ 15,000	$ 3,300
6. Present worth of construction cost, (item 3-5)	$146,000	$330,000
Allowance for technical, legal and administrative cost, (@ 10% of item 3)	$ 16,000	$ 33,000
Net present worth of projects (item 6 + 7)	$162,000	$363,000
Amortized annual capital cost, (@ i=7%, n=20 years)	$ 15,300	$ 34,300

lowances were made for yardwork, [illegible] ing, ventilation, and air conditioning and plumbing, electrical, instrumentation and controls, and contingencies. Cost of plant structure was estimated based on quantity take-offs and unit prices available at the time of analysis.

The estimated construction cost of each treatment alternate is presented in Table 3. For the purpose of salvage value calculations, the initial costs are divided into two separate categories: (1) Structures, with assumed 50-year service life, and (2) process and auxiliary equipment, with 20-year service life. The salvage value at the end of the 20-year planning period was calculated [illegible] straight line depreciation method. Thus for the purpose of comparison, net present worth of capital cost was calculated to be $162,000 for Alternate A and $363,000 for Alternate B (refer to Table 3).

For each alternate, annual operation and maintenance costs were estimated [illegible] under four categories: 1) personnel, 2) electrical power, 3) chemicals, and 4) materials and supplies. These costs estimated for the design year under average operating conditions are presented in Table 4.

Annual man-hour requirements for operation and maintenance of each alternate treatment system were estimated using the guidelines suggested [illegible] were calculated based on estimated current $6.50/man-hour including overhead and fringe benefits.

Details of basic cost criteria used for estimating average annual cost for power, chemicals, materials and supplies are presented in Table 4.

How do costs compare?

Total annual average O&M cost is about the same for each alternate; for example, $19,200 per year for the chlorination-dechlorination-postaeration, and $19,700 per year for ozonation. For a plant with average design capacity of 2.0 mgd, the operating cost per million gallons of wastewater is [illegible] at $26.30 (2.630/1000 gallons) for Alternate A, and $27 (2.700/1000 gallons) for Alternate B.

The difference in capital cost reported as net present worth of the two alternate plans, however, is significant: $162,000 for Alternate A as compared to $363,000 for Alternate B. Amortizing capital cost at an interest rate of [illegible] per year and with 20 equal annual payments, the amortized annual capital costs estimated for each alternate are $15,300 for Alternate A, and $34,300 for Alternate B.

Thus, for the specific case presented herein, a comparison of costs of two alternatives based on total annual capital plus O&M costs indicates that the chlorination-dechlorination-postaeration [illegible] $34,500 total annual cost is cost-effective as compared to the ozonation system having $54,000 total annual cost.

Cost isn't everything

Consideration of various factors is involved in selecting the most suitable alternate out of several promising treatment approaches. Preparing a cost-effective analysis, strictly based on dollar comparison, is an important pre-requisite for the evaluation of alternative treatment systems. But it may not be sufficient to indicate the best alternate in a particular case. For example, the following non-monetary factors which equally influence the decision making must also be carefully evaluated: (1) consideration of public health and safety; (2) assessment of environmental impacts relating to water, air, and land; (3) commitment of irreversible and irretrievable resources including energy, chemicals, and material resources; (4) process considerations including reliability and flexibility of the treatment system and full-scale experience; (5) side benefits of a given treatment process in addition to achieving the required specific goals; (6) considerations for the standpoint of operation and maintenance, such as the level of skill and training of O&M personnel, degree of supervision and control necessary to achieve satisfactory performance, and maintenance requirements to keep the equipment in satisfactory working condition; and (7) implementation capability and public acceptance. A quantitative evaluation of these factors is difficult; nevertheless, a rational evaluation of these factors must be made.

Application of chlorination, dechlorination, and post-aeration has been practiced successfully in municipal and industrial plants in the past. The process equipment is simple from the operation and maintenance standpoint and no special training is required for O&M personnel. Automatic monitoring and control of chemical dose can be achieved employing the available technology. Although chlorine has been used effectively to control pathogenic organisms, its germicidal action against viruses is

(continued on page 56)

4—ESTIMATES OF ANNUAL OPERATING AND MAINTENANCE COST
(1975 Price Level)

Item	Alternate A Chlorination-Dechlorination-Post Aeration	Alternate B Ozonation
1. Personnel	$ [illegible]	$ 5,900
2. Electrical power	$ [illegible]	$11,200
3. Chemicals	$ [illegible]	$ [illegible]
4. Materials and supplies	$ [illegible]	$ 2,500
Total annual O&M cost	$[illegible]	$19,700
O&M cost per million gallons	$ [illegible]	$27.00

[illegible] O&M Cost

a. Operation: 440 man-hr/yr; maintenance: [illegible] @ $6.50/man-hr
b. Operation: 470 man-hr/yr; maintenance: [illegible] @ $6.50/man-hr
c. Power consumption [illegible] @ $0.0[illegible]
d. Power consumption [illegible] kWh/yr, Using [illegible] kWh/lb of O_3 generated
e. [illegible] Chlorine gas bought in [illegible] @ $0.17/lb
f. [illegible] equipment

What's best for disinfection?

(Continued from page 54)

not particularly effective.

There have been serious reservations recently concerning the application of chlorine for the water and wastewater disinfection. Chlorine is known to form carcinogenic compounds when reacting with certain hydrocarbons, especially with those originating from certain organic chemical industrial wastes. It has been suggested that the application of chlorine for effluent disinfection should be restricted if the effluent is to be discharged into a receiving water which is the source of potable water supply. More and more research is being conducted on the above aspects to provide necessary guidance for water quality control.

Ozone does have benefits

Ozonation, on the other hand, is known to produce no toxic substances when applied to achieve effluent disinfection. Additional benefits of the ozonation process are reduction in odor, taste, and color, oxidation of some trace refractory organic compounds, removal of suspended [illegible] oxygen level in the effluent. However, it must be noted that the effluent from the secondary treatment plant containing a higher concentration of suspended solids, organic matter, and oxidizable inorganic compounds would require a higher dose of ozone as compared to the effluent from a tertiary treatment plant in order to achieve effective effluent disinfection. Thus, it is obvious that the application of ozone for effluent disinfection in a secondary treatment plant is less attractive from economic considerations as compared to tertiary treatment plants.

From an operation and maintenance standpoint, the ozonation facility, because of its sophistication, would require more skilled O&M personnel as compared to the chlorination-dechlorination-postaeration facility.

Monitoring and control of the ozone dose is difficult since the ozone is harder to meter and pace with the demand. Also, no residual concentration of ozone can be maintained in the effluent since the ozone is very unstable once it is exposed to the environment. ◻◻

Acknowledgement

[illegible] Havens and Emerson in preparing the treatment system layout and construction cost estimates is gratefully acknowledged.

> *Next month*
>
> **Value engineering the design of an AWT plant**
>
> ☐
>
> **Designing for flooding relief & pollution control**
>
> ☐
>
> **What are the energy requirements for AWT?**

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DELAWARE COUNTY SEWAGE TREATMENT PLANT

1. Flow

1.1 The Environmental Impact Statement report contradicts information with regards to flow:

1.11 The guaranteed release from Delaware Lake is as follows: (pg 2-15)

July 1-10	10 cfs
July 11-20	2 5 cfs
July 21-31	35 cfs
August 1-20	40 cfs
August 21-31	35 cfs
Sept. 1-Oct. 1	20 cfs

1.12 The 7 day - 10 year low flow is 4.54 cfs at the USGS station at Stratford (pg 5-2)

1.13 From USGS surface water records, the minimum flow is 7.6 cfs in a high water tank in the well, (instantaneous flow) Oct. 8,9, 1964. (pg 8-3)

1.2 Our analysis for low flow is as follows:

1.21 The following table lists the low flow in cfs for the past 20 years:

Year	Min. Day		Min. 7 Consecutive Day		Min. Month	
	Flow	Mon.	Flow	Mon.	Flow	Mon.
1955	19	Sept.	20	Sept.	22	Sept.
1956	29	Oct.	30	Oct.	32	Oct.
1957	23	Sept.	26	Sept.	56	Aug.
1958	39	June	55	Oct.	132	Sept.
1959	9	July	12	Sept.	28	Sept.
1960	21	Sept.	22	Sept.	28	Oct:
1961	31	Oct.	33	Oct.	51	Oct.
1952	12	July	13	July	16	June
1963	9	Sept.	10	Sept.	13	Oct.
1964	9	Oct.	11	Oct.	12	Oct.
1965	11	June	13	June	48	Sept.
1966	11	Oct.	13	Oct.	22	Sept.
1967	11	Oct.	13	Sept.	30	Sept.
1968	10	Oct.	12	Oct.	16	Sept.
1969	16	Sept.	19	Sept.	105	Oct.
1970	12	Sept.	13	Sept.	21	Sept.
1971	13	June	15	July	24	Oct.
1972	40	June	49	Aug.	181	June
1973	30	Sept.	34	Sept.	40	Sept.
1974	20	July	22	July	34	July

1.22 There are portions of the service area by the proposed plant currently using water supply form other sources than the Olentangy River. This will add more flow to the river.

1.23 By plotting the data listed in item 1.21 above the low flow for design purposes should be considered as 13 cfs.

1.3 Recommendations:

1.31 The guaranteed release should not be considered as 7 day-10 year low flow.

1.32 From the past 20 years of records the low flow for design should be considered as 13 cfs, except where more flow is released.

2. Ammonia Calculations

2.1 The EIS report listed contradicted information as follows:

2.11 The ammonia calculations are based on;

flow = 4.5 cfs
pH = 8 (pg 1-15)
temp.= 25°C

The above information is inconsistent since the water temperature of 25°C occurs in July and August and the guaranteed release is higher than 4.5 cfs. (see item 1.21)

2.12 The ammonia based on the above conditions, assuming they are consistent, is listed as 0.164 mg/l for a level of 0.025 mg/l unionized ammonia (pg 1-15) is in error. It should be 0.45 mg/l for 0.025 unionized ammonia and 0.37 mg/l for 0.02 unionized ammonia.

2.2 Our analysis for ammonia is as follows:

2.21 Upstream ammonia concentration in mg/l for summer, 1975 is as follows:

	Olentangy River above Delaware STP	Delaware STP
May 1975	1.5	45.1
June 1975	1.6	25.4
July 1975	0.52	15.0
August 1975	0.39	17.6
September 1975	0.47	17.8

2.22 A preliminary report on Delaware Reservoir, EPA, April 1975 supports the above data for higher ammonia concentration from Delaware Lake.

2.23 The proposed effluent ammonia from the proposed plant is higher than that of natural water.

2.24 The computer model results for the Olentangy River are analyzed in item 5.3.

3. Denitrification

3.1 Aerobic denitrification is the most cost effective choice for ammonia removal. To our knowledge denitrification process will have no effect on ammonia removal. (pg I-20)

4. **Chlorination**

4.1 Chlorination should be required in the recreation season and dechlorination should be practiced when the flow in the river is 167 times or less than the average flow from the proposed plant. The above limits are based on 0.5 mg/l total chlorine residual in the effluent and meets the water quality standards of 0.003 mg/l for total chlorine residual.

5. Computer Analysis

5.1 The following computer runs have been made:

5.11 EEQ in the Olentangy prior to construction of the proposed site (chart No. 1)
5.12 Alternative No. 1 - construction of the Delaware County plant with no modification of Delaware STP or Worthington Hills (chart No.1)
5.13 Construction of the Delaware County plant - Improvements to Delaware City plant to meet the NPDES permit; and elimination of Worthington Hills discharge as required by the NPDES permit. (charts No. 3 thru 7)

5.2 The following conditions have been made in the computer model:
5.21 Actual ammonia, BOD loads, and DO are from the monthly report of the City of Delaware (stream above)

5.22 The flow is based on item 1.3 above.

5.23 The design flow from the Delaware plant is 4.5 cfs, discharging at the county line with effluent ammonia level of 1 mg/l.

5.3 Ammonia concentration at different locations for all the alternatives is plotted in the enclosed charts (1thru 7).
5.31 Unionized ammonia of 0.02 mg/l will be met at Worthington gaging station for all year, except during the month of June and the first 10 days of July where the ammonia concentration in the river is 0.8 mg/l and 0.6 mg/l is required to meet the standards. However, with chlorination and dechlorination processed, portions of the ammonia will be oxidixed and thus, the actual ammonia concentration is less than the values reported.
5.32 Unionized ammonia of 0.02 mg/l is violated in the reach between Delaware Lake and Delaware County plant during the last 20 days of July; however, the water quality standards are not violated at Worthington gaging station.
5.33 If Delaware City STP will not be upgraded and Worthington Hills STP will still be discharging; ammonia toxicity will be violated.

SA/sr

Enclosures: Charts 1-7
May, June and July reports for City of Delaware STP
Analysis of Olentangy River from a report by National
Eutrophication Survey for U.S. EPA, 1975

4. Response (to new issues raised)

1. Edward A. Bischoff 3/31/76

C- Purification capabilities of the Olentangy River downstream from Delaware.

R- Improvements are being planned and a permit upgrading has been proposed for 1977, to lessen the impacts of this facility to the Olentangy.

C- High population projects.

R- The 3.0 MGD plant would probably not be used at full capacity at year 20.

C- Zoning controls housing.

R- Present growth is constrained because of the septic tank ordinance, requiring one acre lots, in most instances. Higher density projects such as Planned Unit Developments (PUDs), have been planned in the service area.

2. W. Jay and Helen Limbaugh 3/29/76

C- Well impacts from effluent.

R- Section A-4 in Chapter 5 discusses this topic.

3. L. D. Perry, Manager, Valley Utility Co. 3/30/76

Comments noted.

4. Von Hill, Director, Environmental Research and Action

Comments noted.

5. Gary R. Moore

C- Interbasin transfer of water.

R- Water supply via the Del-Co water company is from the Olentangy River.

C- Withold funding until Columbus EIS is completed.

R- The two grants are separate actions by EPA.

C- Cost figures and conflict of interest.

R- The project costs for the interceptor system and treatment plant proposed in the Facilities Plan were developed by Delaware County and their consultants. In the Final EIS, the additional cost estimates for local alternatives were developed by Enviro Control. The regional cost estimates were developed by EPA.

6. Robert W. McAdams, General Manager, Del-Co Water Company, Inc.
3-29-76 Comments noted.

7. Joy E. Niswender 3-28-76
Comments noted.

8. William L. Foster 3-28-76
Comments noted.

9. Chalmers P. Wylie, Representative to Congress, 5-17-76, 6-7-76

C- Airborne pathogen hazard.

R- Section A-2 of Chapter 5 discusses this topic in detail.

C- Regionalization as a solution.

R- Chapters 3 and 4 have developed new alternatives on regionalization.

10. David E. Northrop, Assitant Attorney General, State of Ohio
6-28-76

C- Legal research on regionalization.

R- This is summarized in section C-9-e of Chapter 3.

C- Desirability of regionalization.

R- Chapters 3 and 4 provide a new discussion of the regionalization alternatives.

11. Delaware County Engineer 5/3/76 (letter not reproduced)

This letter presents answers to information requested by USEPA, which has been incorporated into the Final EIS. Additional comments relate to the cost-effectiveness of the regional sub-alternatives in the Draft EIS. The sub-alternatives considered in the Final EIS are different than those of the Draft document.

12. Delaware County Engineer 5/25/76

C- Definition of regional system.

R- Chapter 3 qualifies the use of the terms local and regional in this EIS. Section A of Chapter 5 addresses water quality impacts.

C- OEPA has modeled levels of chlorine and ammonia.

R- Chapter 5, section A-1 addresses the differences in this low flow modeling, and the values chosen for the EIS.

C- Highbanks Park investment value.

R- These figures arose at the public hearing.

C- Sound levels.

R- This data has been added to the Final EIS in Chapter 5, section F-3.

13. Delaware County Engineer 6-17-76

C- Ozone costs.

R- Environmental protection favors the additional expenditure for ozone. Disinfection is only one part of sewage treatment costs.

C- Ozone leaves no indicator to judge the degree of disinfection.

R- In chlorination practice chlorine is not measured specifically, but rather the oxidant level is measured. Similar approaches can be used for ozone since it is also an oxidant. Additionally, ozone can be measured in off-gases from contactors to judge dosage control. While there is much experience that relates chlorine oxidant level to disinfection efficiency, the actual result is not available until 24 hours later when the microbial tests are evaluated.

C- Ozone discharge to the atmosphere.

R- An ozone destruction system may be installed so there would be no ozone discharge. These systems are commercially available.

C- Ozone is experimental.

R- Full-scale ozone treatment has been documented on many drinking water systems. Implementation for wastewater treatment is emerging and there is no real reason that cross translation of technology, especially on a high quality effluent such as will be produced by the Delaware County tertiary plant, should incur problems. Site visits to existing installations and progress seminars may be arranged for the design engineers. Full-scale treatment plants have been funded by the EPA construction grants program, without any request that EPA assume responsibility for using ozone. The U.S. Congress specifically dictates in PL. 92-500 that new technology msut be applied to preserve the Nation's waters.

C- Filtration would not work because of particle size.

R- The filters chosen for this estimate are capable of removing particles in the 2.0 to 5.5 millimicron range. (note: the Health, Education, and Welfare letter has been reproduced earlier in this section).

14. Ohio EPA May,1976
(note: technical data has not been reproduced).

C- Low flow values.

R- Chapter 2 has developed the low flow values for this EIS. Item 1.11 is the release schedule, rather than the minimum release. Item 1.21 is data from the USGS station near Delaware City, rather than the nearby Worthington station. Item 1.22 will not alter the volume of effluent discharged. The 13 cfs value is higher than the 9.7 cfs developed by USGS for the historical modified 7-day, once in 10-year low flow.

C- Ammonia values.

R- Chapter 2 has covered our low flow values. The corrections of calculations in item 2.12 have been noted in the Final EIS. Chapter 4 discusses ammonia impacts and concentrations. Ammonia removal is also discussed in Chapter 4.

C- Chlorination - dechlorination should be used only as needed.

R- The Final EIS recommends ozonation for disinfection.

C- Computor data are presented.

R- Low flows differ from our analysis.

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Appendix A

Final Effluent Limitations OEPA Permit No. K 901 AD

During the period beginning when (a) facilities becomes operational, or (b) infiltration/inflow is eliminated, whichever occurs first and is applicable, and continuing therafter, the 30-day average quantity of effluent discharged from the wastewater treatment facility shall not exceed 1.5 MGD and the quality of effluent discharged by the facility shall be limited at all times as follows:

A. The arithmetic mean of the BOD_5 samples collected in a period of 30 consecutive days shall not exceed a concentration of 8 mg/l or a total quantity of 45.4 kg/day. The arithmetic mean of these values for effluent samples collected in a period of seven consecutive days shall not exceed a concentration of 12 mg/l or a total quantity of 68.1 kg/days.

B. The arithmetic mean of the suspended solids values for effluent samples collected in a period of 30 consecutive days shall not exceed a concentration of 8 mg/l or a total quantity of 45.4 kg/day. The arithmetic mean of these values for effluent samples collected in a period of seven consecutive days shall not exceed a concentration of 12 mg/l or a total quantity of 68.1 kg/day.

C. The effluent values for pH shall remain within the limits of 6.0 to 9.0. The pH limitation is not subject to averaging and must be met at all times.

D. The geometric mean of the fecal coliform bacteria values for effluent samples collected in a period of 30 consecutive days shall not exceed 200 per 100 milliliters. The geometric mean of these values for effluent samples collected in a period of seven consecutive days shall not exceed 400 per 100 milliliters.

E. The Chlorine residual at the point of discharge shall not exceed 0.5 mg/l at any time.

F. The 30-day mean of ammonia nitrogen values for effluent samples collected during the months of July thru October shall not exceed a concentration of 1.5 mg/l or a total quantity of 8.5 kg/day. During the same period the 7-day mean shall not exceed a concentration of 1.5 mg/l or a total quantity of 8.5 kg/day.

G. The 30-day mean of ammonia nitrogen values for effluent samples collected during the months of November thru June shall not exceed a concentration of 1.5 mg/l or a total quantity of 8.5 kg/day. During the same period the 7-day mean shall not exceed a concentration of 1.5 mg/l or a total quantity of 8.5 kg/day.

Appendix B Surface Water 1. Discharge Data

SCIOTO RIVER BASIN

03228805 Alum Creek at Africa, Ohio

LOCATION.--Lat 40°11'00", long 82°57'47", in SE 1/4 sec. 1, T.3 N., R.18 W., Delaware County, on right bank 400 ft (122 m) upstream of bridge on Lewis Center Road, 1,200 ft (366 m) downstream from outlet of Alum Creek dam, mi (0.5 km) west of Africa, 2.8 mi (4.5 km) upstream from Westerville Reservoir outlet, and 4.2 mi (6.8 km) northwest of Westerville.

DRAINAGE AREA.--122 mi² (316 km²).

PERIOD OF RECORD.--Occasional low-flow measurements, water year 1962, June 1963 to current year.

GAGE.--Water-stage recorder. Datum of gage is 800.00 ft (243.840 m) above mean sea level (levels by Corps of Engineers). Oct. 17, 1973 to July 9, 1974 nonrecording gage at bridge ft (121.920 m) downstream at same datum. Prior to Oct. 17, 1973 water-stage recorder 600 ft (182.880 m) downstream at datum 17.37 higher.

AVERAGE DISCHARGE.--11 years, 125 ft³/s (3.540 m³/s).

EXTREMES.--Current year: Maximum observed discharge, 629 ft³/s (17.8 m³/s) Jan. 28, gage height, 23.66 ft (7.2 m); minimum daily, 0.84 ft³/s (0.024 m³/s) July 11, 12.
Period of record: Maximum discharge, 6,160 ft³/s (174 m³/s) Mar. 10, 1964, gage height, 13.95 ft (4.25 m), from graph based on gage readings, site and datum then in use; no flow at times 1963-65.
Flood of Mar. 5, 1963 reached a stage of 14.2 ft (4.33 m), from floodmarks, discharge, 6,460 ft³/s (18 m³/s).

REMARKS.--Records good except for Oct. 17 to July 12, which are poor. Flow regulated by Alum Creek Lake since October 1973. Water-quality records for the current year are published in Part 2 of this report.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1973 TO SEPTEMBER 1974

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	9.9	20	354	229	528	265	283	54	54	34	8.0	9.7
2	3.4	26	350	212	500	270	327	28	54	32	8.2	8.5
3	2.0	31	347	210	470	260	336	79	56	31	5.3	14
4	3.6	30	323	210	444	250	369	90	50	31	5.3	10
5	7.0	29	300	210	432	241	364	40	51	27	4.1	9.6
6	1.9	18	314	210	429	229	360	17	51	23	4.7	9.0
7	1.1	12	288	212	426	220	350	17	49	20	6.2	8.5
8	1.1	12	247	212	415	212	350	29	48	15	6.2	8.5
9	1.1	11	210	210	410	210	350	79	48	10	6.7	8.5
10	1.7	10	191	205	400	200	338	72	47	.90	6.7	8.5
11	1.5	9.9	170	205	391	196	334	76	45	.84	6.7	9.1
12	3.8	9.5	163	210	364	177	324	78	44	.84	6.7	13
13	4.7	8.0	163	205	352	175	328	68	43	.89	6.7	7.6
14	4.7	15	161	199	345	152	320	26	41	1.2	6.2	7.6
15	3.8	19	155	197	316	140	316	76	40	3.7	5.7	7.6
16	3.0	18	150	206	272	180	306	71	39	8.0	4.9	13
17	2.8	18	146	212	230	180	300	39	37	8.0	5.7	13
18	3.1	19	144	216	210	180	286	74	37	8.0	4.1	13
19	3.6	15	159	231	203	180	281	74	35	8.0	4.1	12
20	3.6	18	220	300	200	185	270	71	30	8.0	4.1	12
21	3.6	16	260	417	210	185	265	68	30	8.0	3.7	12
22	3.4	21	260	534	210	166	258	67	32	8.0	3.2	11
23	3.2	22	254	554	220	150	245	70	30	11	2.8	11
24	3.2	45	228	573	280	140	235	68	39	10	2.4	11
25	3.6	170	205	531	283	129	223	68	41	9.0	2.0	11
26	3.6	180	258	519	278	134	214	60	40	9.0	2.4	11
27	3.6	252	254	496	260	159	200	52	39	9.0	2.1	11
28	3.6	329	250	424	267	188	170	51	38	9.0	5.2	11
29	7.0	531	242	589	------	212	57	52	37	9.0	6.9	11
30	4.0	522	231	557	------	240	79	52	35	9.0	6.7	10
31	13	------	231	542	------	270	------	53	------	8.5	12	------
TOTAL	119.2	2,436.4	7,226	10,037	9,345	6,075	8,437	1,819	1,264	370.87	164.5	311.7
MEAN	3.85	81.2	233	324	334	196	281	58.7	42.1	12.0	5.31	10.4
MAX	13	531	354	589	528	270	369	90	54	34	12	14
MIN	1.1	8.0	144	197	200	129	57	17	30	.84	2.1	7.6

CAL YR 1973 TOTAL 59,620.30 MEAN 163 MAX 3,540 MIN 1.1
WTR YR 1974 TOTAL 47,605.67 MEAN 130 MAX 589 MIN .84

Source: (USGS, 1975, pt. 1)

SCIOTO RIVER BASIN

03221000 Scioto River below O'Shaughnessy Dam, near Dublin, Ohio

LOCATION.--Lat 40°08'36", long 83°07'14", Delaware County, on left bank, 0.2 mi (0.3 km) north of county line, 0.8 mi (1.3 km) downstream from O'Shaughnessy Dam, and 3.0 mi (4.8 km) north of Dublin.

DRAINAGE AREA.--980 mi² (2,538 km²).

PERIOD OF RECORD.--April 1921 to current year.

GAGE.--Water-stage recorder. Datum of gage is 775.00 ft (236.220 m) above mean sea level, adjustment of 1912. Prior to Aug. 26, 1921, nonrecording gage at site 0.8 mi (1.3 km) upstream at same datum. Aug. 26, 1921, to Oct. 13, 1926, nonrecording gage at site 100 ft (30 m) downstream at same datum.

AVERAGE DISCHARGE.--53 years, 784 ft³/s (22.20 m³/s).

EXTREMES.--Current year: Maximum discharge, 14,100 ft³/s (399 m³/s) Jan. 21, gage height, 11.59 ft (3.533 m); minimum, 24 ft³/s (0.68 m³/s) Aug. 30.

Period of record: Maximum discharge, 55,200 ft³/s (1,560 m³/s) Jan. 22, 1959, gage height, 22.04 ft (6.718 m), from floodmark; minimum, 0.4 ft³/s (0.011 m³/s) Nov. 8, 1926.

Flood of March 25, 1913 reached a stage of 24.6 ft (7.50 m), discharge, 74,500 ft³/s (2,110 m³/s) at Griggs Dam, 9 mi (14 km) downstream from gage, computed by C. E. Sherman, Ohio State University.

REMARKS.--Records good. Flow regulated since 1926 by O'Shaughnessy Reservoir 0.8 mi (1.3 km) upstream (see station 03220500). Water-quality records for the current year are published in Part 2 of this report.

REVISIONS (WATER YEARS).--WSP 803: 1921-35. WSP 1725: 1926. WSP 1908: Drainage area.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1973 TO SEPTEMBER 1974

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	64	422	2,490	1,700	1,800	1,310	3,640	272	205	97	59	71
2	62	519	1,730	1,030	1,280	1,680	5,750	263	167	95	59	78
3	64	404	1,040	820	955	1,520	5,960	296	137	90	59	100
4	71	300	835	760	797	1,230	5,340	254	122	87	59	76
5	101	235	1,050	570	628	1,040	3,840	233	107	85	57	71
6	134	176	917	480	546	1,130	3,910	225	97	78	51	128
7	146	153	778	420	823	1,280	3,250	169	95	76	46	140
8	125	140	547	378	606	1,190	2,320	189	105	74	46	105
9	381	134	479	400	672	1,030	1,840	221	105	71	46	85
10	300	119	428	410	533	1,100	2,550	209	97	67	46	76
11	292	101	386	370	513	1,560	2,400	233	95	53	44	76
12	150	98	342	320	453	1,590	1,750	277	90	49	42	87
13	131	98	353	280	500	1,340	1,280	340	85	49	44	408
14	131	98	479	330	976	1,110	1,040	566	83	48	44	831
15	169	104	715	526	1,430	823	983	445	85	48	44	520
16	156	113	692	2,140	1,120	1,150	648	320	85	44	46	305
17	125	163	453	4,410	797	1,850	628	310	85	42	53	144
18	119	180	331	4,870	628	1,610	513	366	85	42	46	134
19	90	169	358	10,300	694	1,240	451	254	85	41	39	182
20	101	150	554	13,100	1,770	901	388	209	85	31	34	192
21	78	156	802	13,400	1,950	781	355	189	87	29	32	[illegible]
22	75	163	786	11,000	2,400	709	355	186	90	29	34	[illegible]
23	73	183	677	8,560	2,750	740	361	229	271	33	[illegible]	[illegible]
24	73	219	554	6,670	2,200	717	355	296	355	32	[illegible]	[illegible]
25	73	1,640	893	4,870	1,750	679	305	254	250	136	[illegible]	[illegible]
26	75	3,750	3,920	3,630	1,050	628	286	217	201	[illegible]	[illegible]	[illegible]
27	71	3,630	6,820	4,190	704	781	263	178	157	[illegible]	[illegible]	[illegible]
28	73	4,100	6,640	4,090	814	874	246	147	128	[illegible]	[illegible]	[illegible]
29	90	3,950	5,490	3,560	------	1,900	241	189	[illegible]	[illegible]	[illegible]	[illegible]
30	206	3,230	4,430	3,220	------	4,750	254	259	[illegible]	[illegible]	[illegible]	[illegible]
31	441	------	2,790	2,520	------	4,610	------	233	------	[illegible]	[illegible]	------
TOTAL	4,150	24,897	48,853	109,240	31,487	42,853	51,702	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MEAN	134	830	1,576	3,524	1,125	1,382	1,723	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MAX	441	4,100	6,820	13,400	2,750	4,750	5,960	566	[illegible]	[illegible]	[illegible]	[illegible]
MIN	62	98	331	280	453	628	241	147	[illegible]	[illegible]	[illegible]	[illegible]

CAL YR 1973 TOTAL 424,401 MEAN 1,163 MAX 8,130 MIN 62
WTR YR 1974 TOTAL 332,929 MEAN 912 MAX 13,400 MIN 29

SCIOTO RIVER BASIN

03227500 Scioto River at Columbus, Ohio

LOCATION.--Lat 39°54'34", long 83°00'33", Franklin County, on right bank at sewage-treatment works of city of Columbus, 0.4 mi (0.6 km) downstream from bridge on Frank Road, 2.8 mi (4.5 km) upstream from Scioto Big Run, and 5 mi (8 km) downstream from Olentangy River.

DRAINAGE AREA.--1,629 mi² (4,219 km²).

PERIOD OF RECORD.--October 1920 to current year. Monthly discharge only for some periods, published in WSP 1305.

GAGE.--Water-stage recorder. Datum of gage is 680.00 ft (207.264 m) above mean sea level. Prior to Oct. 1, 1928, nonrecording gage at site 200 ft (61 m) upstream at same datum.

AVERAGE DISCHARGE.--54 years, 1,375 ft³/s (38.94 m³/s).

EXTREMES.--Current year: Maximum discharge, 15,900 ft³/s (450 m³/s) Jan. 21, gage height, 18.18 ft (5.541 m); minimum, 132 ft³/s (3.74 m³/s) July 21, 27, 28.

Period of record: Maximum discharge, 68,200 ft³/s (1,930 m³/s) Jan. 22, 1959, gage height, 27.22 ft (8.297 m), from high-water mark in well, from rating curve extended above 46,000 ft³/s (1,300 m³/s); minimum, 42 ft³/s (1.19 m³/s) Sept. 6, 1930.

Flood of Mar. 25, 1913 reached a stage of 25.9 ft (7.89 m), discharge, 138,000 ft³/s (3,910 m³/s), estimated by Franklin County Conservancy District.

REMARKS.--Records good. Flow regulated by Griggs Reservoir 10.8 mi (16.7 km) upstream (see station 03221500), O'Shaughnessy Reservoir 20.4 mi (32.8 km) upstream (see station 03220500), and Delaware Lake 35 mi (56 km) upstream from station (see station 03225000). Records include only part of sewage return flow for city of Columbus. Water supply for city of Columbus is obtained from Scioto River downstream from Griggs Dam, Big Walnut Creek downstream from Central College, and from well field in Alum Creek basin. For statement on diversions from Alum Creek basin and Big Walnut Creek, see REMARKS for stations 03229000 and 03229500. Water-quality records for the current year are published in Part 2 of this report.

REVISIONS (WATER YEARS).--WSP 743: 1927(M). WSP 803: 1922-24, 1926-30, 1932-33. WSP 1908: Drainage area.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1973 TO SEPTEMBER 1974

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1,420	1,190	5,840	3,130	3,290	1,840	5,980	585	579	321	170	630
2	811	1,010	4,550	1,960	2,330	2,510	8,460	512	419	284	207	397
3	335	972	2,880	1,500	1,880	2,700	9,280	771	353	279	348	929
4	335	818	1,680	1,530	1,450	2,420	11,900	636	332	269	414	591
5	350	671	2,060	1,360	1,150	2,000	7,220	598	245	518	222	460
6	255	506	2,020	1,140	1,340	1,720	5,950	554	380	315	198	524
7	290	416	1,870	1,070	2,500	1,940	4,980	454	518	260	207	617
8	295	330	1,570	972	1,990	2,130	4,230	448	284	255	212	548
9	340	320	1,120	951	1,610	2,230	3,560	598	269	260	236	431
10	572	295	972	1,110	1,240	1,760	3,920	483	255	250	222	353
11	500	280	874	1,040	1,110	3,080	3,640	454	236	236	202	332
12	350	250	783	923	1,060	3,620	3,040	743	232	222	207	489
13	335	250	888	769	1,020	2,820	2,400	750	212	217	207	579
14	368	245	1,080	746	1,320	2,090	1,900	1,120	198	250	289	1,420
15	300	542	1,270	1,160	2,210	1,580	1,620	1,280	489	241	217	1,230
16	350	584	1,470	3,090	2,120	1,840	1,410	864	448	212	202	958
17	368	500	1,310	5,890	1,600	2,640	1,190	702	326	212	643	702
18	295	566	867	7,200	1,310	3,040	1,080	1,420	212	193	310	530
19	280	572	734	11,600	1,260	2,520	1,020	757	212	202	321	391
20	255	664	1,550	13,800	2,370	1,820	843	530	241	175	300	560
21	245	832	1,970	14,800	3,240	1,640	750	425	477	179	212	466
22	225	741	2,040	13,500	3,600	1,460	778	397	750	212	212	315
23	210	706	1,670	13,200	4,140	1,290	709	885	2,140	227	236	284
24	205	1,380	1,470	11,900	3,920	1,320	675	835	1,100	188	202	245
25	190	4,160	1,360	9,950	3,200	1,340	643	828	1,080	179	198	241
26	185	5,990	4,530	8,670	1,940	1,320	682	689	1,170	170	217	232
27	175	6,470	11,100	8,920	1,380	1,420	604	500	656	166	227	241
28	220	8,020	10,000	8,410	1,390	1,490	554	436	512	170	375	591
29	578	5,050	8,220	5,830	------	3,630	506	524	425	188	591	414
30	650	5,680	6,240	5,540	------	7,730	604	1,020	364	193	591	454
31	825	------	4,550	4,110	------	7,380	------	750	------	179	300	------
TOTAL	12,112	50,010	88,538	165,773	57,170	76,320	90,128	21,548	15,114	7,222	8,695	16,154
MEAN	391	1,667	2,856	5,348	2,042	2,462	3,004	695	504	233	280	538
MAX	1,420	8,020	11,100	14,800	4,140	7,730	11,900	1,420	2,140	518	643	1,420
MIN	175	245	734	746	1,020	1,290	506	397	198	166	170	232

CAL YR 1973 TOTAL 753,277 MEAN 2,064 MAX 20,600 MIN 175
WTR YR 1974 TOTAL 608,784 MEAN 1,668 MAX 14,800 MIN 166

SCIOTO RIVER BASIN

03226800 Olentangy River near Worthington, Ohio

LOCATION.--Lat 40°06'37", long 83°01'55", in NW 1/4 T.2 N., R.18 W., Franklin County, on left bank 350 ft (107 m) downstream from Interstate Highway 270 bridge, 1.5 mi (2.4 km) northwest of Worthington and 2.8 mi (4.5 km) upstream from Rush Run.

DRAINAGE AREA.--497 mi² (1,287 km²).

PERIOD OF RECORD.--October 1955 to current year.

GAGE.--Water-stage recorder. Datum of gage is 743.20 ft (226.527 m) above mean sea level.

AVERAGE DISCHARGE.--19 years, 441 ft³/s (12.49 m³/s).

EXTREMES.--Current year: Maximum discharge, 5,320 ft³/s (151 m³/s) Jan. 23, gage height, 7.40 ft (2.256 m); minimum, 17 ft³/s (0.48 m³/s) Sept. 27.

Period of record: Maximum discharge, 16,500 ft³/s (467 m³/s) Jan. 21, 1959, gage height, 15.68 ft (4.779 m), from high-water mark in well; minimum, 7.6 ft³/s (0.22 m³/s) Oct. 8, 9, 1964.

Flood in January 1952 reached a stage of 15.3 ft (4.66 m), discharge, 15,100 ft³/s (428 m³/s), from information by Corps of Engineers.

REMARKS.--Records good. Flow regulated by Delaware Lake 21 mi (34 km) upstream (see station 03225000). Water-quality records for the current year are published in Part 2 of this report.

REVISIONS (WATER YEARS).--WSP 1625: 1952(M). WSP 1908: Drainage area. WRD Ohio 1972: 1971(M).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1973 TO SEPTEMBER 1974

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	48	304	3,050	600	759	432	2,200	76	70	45	36	83
2	60	271	2,040	450	525	681	1,500	117	54	36	38	76
3	46	256	895	300	462	825	2,000	163	48	34	53	178
4	38	233	399	410	251	525	2,400	236	46	29	72	174
5	41	123	665	438	241	673	2,100	226	44	45	64	204
6	39	118	688	432	272	572	1,500	170	44	41	55	294
7	33	71	719	241	636	621	1,100	135	60	34	51	288
8	34	45	593	413	681	945	760	123	76	32	48	191
9	34	45	222	370	643	961	620	152	56	32	48	90
10	110	45	210	236	379	1,140	550	135	52	34	50	79
11	59	45	210	200	305	2,720	620	132	52	36	48	55
12	49	45	210	190	294	961	700	246	52	34	48	152
13	42	45	220	180	277	658	520	366	50	34	50	111
14	47	45	372	170	399	426	350	600	42	29	58	317
15	34	61	474	300	579	420	260	572	36	24	53	322
16	106	186	538	600	545	600	261	322	35	21	50	305
17	60	180	400	1,550	406	1,000	272	256	35	20	101	213
18	47	203	170	2,110	372	1,300	317	379	35	20	58	101
19	49	230	220	3,420	294	1,000	299	236	35	20	53	53
20	41	316	280	1,990	593	450	226	135	41	20	57	38
21	29	335	820	2,050	817	500	170	98	41	88	51	60
22	27	327	780	3,180	977	440	142	95	53	32	36	36
23	26	314	640	4,900	1,040	380	135	142	462	36	34	30
24	24	378	538	4,610	1,310	420	170	142	282	40	27	24
25	25	1,460	621	4,490	1,320	490	204	462	213	34	29	21
26	26	1,610	2,010	4,400	1,080	510	217	174	114	32	30	20
27	25	1,240	3,840	4,660	261	390	191	163	159	32	32	18
28	26	1,640	3,040	2,830	366	370	138	148	88	32	70	41
29	68	557	1,930	1,720	------	950	135	110	74	38	86	182
30	181	2,820	1,200	1,520	------	1,500	83	155	66	40	98	109
31	264	------	945	930	------	2,000	------	100	------	36	51	------
TOTAL	1,738	13,748	28,939	49,890	16,084	24,850	20,140	6,566	2,515	1,060	1,635	3,865
MEAN	56.1	458	934	1,609	574	802	671	212	83.8	34.2	52.7	129
MAX	264	2,820	3,840	4,900	1,320	2,720	2,400	600	462	88	101	322
MIN	24	45	170	170	241	370	83	76	35	20	27	18

CAL YR 1973 TOTAL 221,461 MEAN 607 MAX 5,500 MIN 24
WTR YR 1974 TOTAL 171,030 MEAN 469 MAX 4,900 MIN 18

SCIOTO RIVER BASIN

03225500 Olentangy River near Delaware, Ohio

LOCATION.--Lat 40°21'18", long 83°04'02", NE 1/4 T.5 N., R.19 W., Delaware County, on left bank 500 ft (152 m) upstream from highway bridge, 1,000 ft (305 m) downstream from Delaware Dam, 1,300 ft (396 m) upstream from Norfolk and Western Railway bridge, and 4.0 mi (6.4 km) north of Delaware.

DRAINAGE AREA.--393 mi² (1,018 km²).

PERIOD OF RECORD.--October 1923 to September 1934, April 1938 to current year. Monthly discharge only for some periods, published in WSP 1305.

GAGE.--Water-stage recorder and concrete control. Datum of gage is 799.58 ft (243.712 m) above mean sea level (levels by Corps of Engineers). Prior to Oct. 1, 1950, water-stage recorder at site 500 ft (152 m) downstream at datum 76.7 ft (23.38 m) higher.

AVERAGE DISCHARGE.--47 years, 346 ft³/s (9.799 m³/s).

EXTREMES.--Current year: Maximum discharge, 4,230 ft³/s (120 m³/s) Jan. 26, gage height, 86.69 ft (26.423 m); minimum, 15 ft³/s (0.42 m³/s) Mar. 28, 29,, gage height, 79.78 ft (24.317 m).

Period of record: Maximum discharge, 14,100 ft³/s (399 m³/s) Mar. 21, 1927, gage height, 16.9 ft (5.15 m), site and datum then in use; minimum, 0.1 ft³/s (0.003 m³/s) Aug. 20, 1930, Sept. 14-29, 1934.

REMARKS.--Records good. Flow completely regulated by Delaware Lake since 1951 (see station 03225000). Water-quality records for the current year are published in Part 2 of this report.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1973 TO SEPTEMBER 1974

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	27	280	2,640	440	583	457	931	82	39	26	42	61
2	27	280	1,710	235	466	729	1,210	105	39	26	45	80
3	26	280	515	305	286	793	1,720	181	39	26	46	123
4	27	185	311	368	177	565	1,940	210	39	26	46	169
5	27	141	457	246	177	415	1,680	173	39	26	46	246
6	27	80	629	181	230	375	1,180	119	39	26	46	274
7	27	51	610	235	491	523	757	105	40	26	46	215
8	27	51	339	201	648	816	610	105	40	26	46	119
9	111	51	201	185	431	648	483	108	40	26	45	78
10	76	51	188	185	257	1,010	406	108	40	26	45	50
11	49	51	166	185	257	1,790	507	108	40	26	45	37
12	32	51	166	181	220	1,410	548	191	39	26	45	56
13	25	51	166	129	240	931	423	406	39	26	45	201
14	25	51	286	105	448	466	225	557	30	26	45	286
15	111	158	431	215	574	375	193	406	27	26	45	286
16	78	197	483	466	466	531	193	185	27	26	45	220
17	51	220	286	1,340	368	918	240	145	27	26	45	132
18	51	235	129	1,750	251	1,040	262	145	27	26	45	42
19	36	325	169	2,110	193	620	215	100	27	26	45	25
20	24	368	193	1,320	592	339	166	54	27	85	40	25
21	24	368	639	1,550	801	375	126	45	27	33	37	25
22	24	368	648	3,200	808	325	82	45	116	37	37	25
23	24	360	540	4,100	1,120	220	126	46	169	36	37	25
24	24	360	415	4,080	1,050	311	162	162	162	36	37	25
25	24	729	353	4,100	499	375	197	346	90	36	37	21
26	24	962	1,640	4,080	225	305	185	126	97	36	37	22
27	24	816	2,930	3,810	240	274	138	116	72	36	37	24
28	24	523	2,390	2,180	268	240	119	102	51	36	38	45
29	105	764	1,460	1,740	------	823	65	80	45	36	39	177
30	197	2,640	892	1,270	------	1,160	31	78	26	36	38	20
31	280	------	786	884	------	1,660	------	51	------	36	38	------
TOTAL	1,658	11,047	22,768	41,376	12,366	20,819	15,120	4,780	1,559	973	1,310	3,134
MEAN	53.5	368	734	1,335	442	672	504	154	52.0	31.4	42.3	104
MAX	280	2,640	2,930	4,100	1,120	1,790	1,940	557	169	85	46	286
MIN	24	51	129	105	177	220	31	45	26	26	37	20

CAL YR 1973 TOTAL 171,586 MEAN 470 MAX 3,970 MIN 16
WTR YR 1974 TOTAL 136,910 MEAN 375 MAX 4,100 MIN 20

2. Surface Water Quality

Surface Water Quality, Alum Creek and the Olentangy River
units - mg/1

Source: Olive, 1971

Stream and Station (km from mouth)	Bicarbonate	Carbonate	Chloride	Calcium	Magnesium	Oxygen	Total Phosphate	Silica	Sulfate	pH	Temp (C)	Turbidity (ppm)	Seasons Sampled	No. of Samples
Alum Creek														
4	204	3	63	216	96	9.5	1.57	30	189	8.4	13	46	WSSA	19
28	185	0	76	206	99	7.5	1.90	11	130	8.5	22	41	Su	2
32	192	0	81	234	118	10.7	.26	4	200	8.2	16	19	WSSA	10
36	202	8	69	206	93	9.2	.51	30	195	8.5	11	22	WSSA	11
48	186	0	69	165	88	9.5	.22	17	100	8.3	20	6	Su	2
60	194	3	116	230	122	10.5	.98	20	191	8.5	13	10	WSSA	20
Olentangy River														
23	153	0	36	163	58	6.9	.95	3	55	8.5	23	140	Su	2
39	158	0	43	180	56	8.6	2.13	27	62	8.4	22	140	Su	2
47	164	0	36	152	86	7.2	.32	4	99	8.3	24	64	Su	5
74	170	0	39	191	71	7.5	1.27	3	55	8.3	21	156	Su	2
88	190	5	32	200	75	8.8	1.55	3	115	8.5	21	29	Su	2

Sampling Station Locations 1971 (Olive Report)

Alum Creek

km from mouth	4	S.E. Columbus
	28	Westerville Treatment Plant
	32	Below Westerville Reservoir
	36	I-71
	48	State Route 37
	60	Myers Road

Olentangy River

km from mouth	23	Highbanks area
	39	Below Delaware City treatment plant
	47	Above Delaware City below Delaware Lake
	74	Above Delaware Lake
	88	Caledonia

SCIOTO RIVER BASIN

03228805 ALUM CREEK AT AFRICA, OHIO

LOCATION.--Lat 40°10'56", long 82°57'42", in SE 1/4 sec.1, T.3 N., R.18 W., Delaware County, at gaging station on left bank at downstream side of bridge on Orange Township Road 109, 0.3 mi (0.5 km) west of Africa, 0.3 mi (0.5 km) downstream from outlet of Alum Creek dam, 2.7 mi (4.3 km) upstream from Westerville Reservoir outlet, and 4.2 mi (6.8 km) northwest of Westerville.

DRAINAGE AREA.--122 mi² (316 km²).

PERIOD OF RECORD.--Chemical analyses: Water year 1965 (partial-record station); October 1965 to September 1970; water years 1970-73 (partial-record station).
Water temperatures: October 1965 to September 1970.
Sediment records: October 1969 to December 1972 (partial-record station); January to June 1973 (discontinued).

REMARKS.--Flow affected by ice Jan. 8-11, Feb. 7-14, 17-27. Flow partially regulated by unfinished Alum Creek Dam.

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1972 TO SEPTEMBER 1973

DATE	TIME	INSTANTANEOUS DISCHARGE (CFS)	TOTAL CALCIUM (CA) (MG/L)	TOTAL MAGNESIUM (MG) (MG/L)	BICARBONATE (HCO3) (MG/L)	CARBONATE (CO3) (MG/L)	DISSOLVED SULFATE (SO4) (MG/L)	DISSOLVED CHLORIDE (CL) (MG/L)	DISSOLVED FLUORIDE (F) (MG/L)	TOTAL FLUORIDE (F) (MG/L)	TOTAL NITRITE (N) (MG/L)
OCT., 1972											
05...	1110	138	--	--	--	--	--	--	--	--	--
DEC.											
08...	1520	610	--	--	--	--	58	21	--	--	--
MAR., 1973											
26...	1030	76	--	--	--	--	97	31	--	--	--
27...	1340	61	--	--	--	--	--	--	--	--	--
MAY											
17...	1400	54	--	--	--	--	--	-	--	--	--
JULY											
17...	1425	15	--	--	--	--	120	58	--	--	--
SEP.											
07...	1210	2.3	--	--	239	0	150	69	--	.2	.00

DATE	DISSOLVED NITRATE (N) (MG/L)	TOTAL NITRATE (N) (MG/L)	TOTAL PHOSPHORUS (P) (MG/L)	HARDNESS (CA,MG) (MG/L)	NON-CARBONATE HARDNESS (MG/L)	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)	DISSOLVED SOLIDS (RESIDUE AT 180 C) (MG/L)	TOTAL RESIDUE (MG/L)	TEMPERATURE (DEG C)
OCT., 1972										
05...	--	--	--	--	--	633	--	--	--	15.0
DEC.										
08...	2.3	--	--	720	--	371	7.1	--	--	1.5
MAR., 1973										
26...	1.6	--	--	250	--	529	8.0	--	--	8.0
27...	--	--	--	--	--	407	--	--	--	8.0
MAY										
17...	--	--	--	--	--	619	--	--	--	12.0
JULY										
17...	.30	--	--	350	--	766	7.3	--	--	25.0
SEP.										
07...	--	.37	.01	--	--	781	7.8	--	668	25.5

source: (USGS, 1973, pt.2)

SCIOTO RIVER BASIN

03228805 ALUM CREEK AT AFRICA, OHIO

LOCATION.--Lat 40°10'56", long 82°57'42", in SE¼ sec.1, T.3 N., R.18 W., Delaware County, at gaging station at bridge on Orange Township Road 108, 0.3 mile west of Africa, and 4.2 miles northeast of Westerville.

DRAINAGE AREA.--123 sq mi.

PERIOD OF RECORD.--Chemical analyses: December 1964 to August 1968 (periodic), October 1968 to September 1969.
Water temperatures: October 1968 to September 1969.

EXTREMES.--1968-69:
Specific conductance: Maximum daily, 1,080 micromhos Oct. 24, 26, 28, 29, 31; minimum daily, 205 micromhos May 19.
Water temperatures: Maximum, 33.0°C June 28, July 17, 27; minimum, freezing point on several days during January to March.

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1968 TO SEPTEMBER 1969

DATE	TIME	DIS-CHARGE (CFS)	IRON (FE) (UG/L)	TOTAL MAN-GANESE (MN) (UG/L)	BICAR-BONATE (HCO3) (MG/L)	CAR-BONATE (CO3) (MG/L)	SULFATE (SO4) (MG/L)	CHLO-RIDE (CL) (MG/L)	FLUO-RIDE (F) (MG/L)	NITRATE (NO3) (MG/L)
OCT.										
03...	—	A1.8	—	—	234	0	189	72	.3	.6
07...	0900	2.8	180	200	—	—	—	—	—	—
15...	0830	5.8	—	—	278	0	219	70	.3	.5
28...	0830	6.6	—	—	296	0	233	68	.4	.3
NOV.										
04...	0845	A7.9	180	50	—	—	—	—	—	—
07...	0830	9.3	—	—	300	0	226	68	.4	.8
22...	0830	17	—	—	220	0	165	96	.3	5.8
30...	0830	92	—	—	120	0	97	63	.2	20
DEC.										
04...	0825	150	190	20	—	—	—	—	—	—
14...	0830	A18	—	—	224	0	191	64	.3	7.4
18...	0830	17	—	—	268	0	179	76	.3	6.3
JAN.										
01...	0840	A110	—	—	152	0	114	38	.1	9.8
16...	0830	A15	—	—	292	0	176	76	.2	1.8
22...	1200	A130	240	20	—	—	—	—	—	—
30...	0830	2050	—	—	46	0	40	15	.0	7.8
FEB.										
01...	0800	552	—	—	92	0	64	27	.2	15
07...	0830	72	—	—	168	0	100	112	.2	8.5
07...	1100	73	200	30	—	—	—	—	—	—
14...	0830	440	—	—	200	0	125	54	.2	7.5
MAR.										
07...	0830	A39	—	—	196	0	148	57	.2	2.6
18...	1600	A30	200	50	—	—	—	—	—	—
22...	0830	38	—	—	196	0	169	61	.2	.6
28...	0830	144	—	—	142	0	110	45	.2	10
APR.										
03...	0830	89	—	—	168	0	128	56	.2	2.7
17...	0815	—	78	18	—	—	—	—	—	—
19...	0830	2570	—	—	66	0	47	18	.2	8.6
MAY										
07...	0830	446	—	—	200	0	134	48	.2	1.8
08...	1430	—	80	60	—	—	—	—	—	—
17...	0830	66	—	—	180	0	114	42	.2	4.1
19...	0830	4210	—	—	54	0	35	8.0	.2	9.8
JUNE										
02...	0830	57	—	—	216	0	112	44	.2	2.5
03...	1015	—	70	70	—	—	—	—	—	—
05...	0830	71	—	—	228	0	122	54	.3	2.3
23...	0830	1570	—	—	108	0	62	18	.2	8.7
JULY										
01...	0900	A44	58	220	—	—	—	—	—	—
03...	0830	A34	—	—	224	0	109	98	.3	17
12...	0830	498	—	—	104	0	50	22	.2	9.5
24...	0830	85	—	—	186	0	70	56	.3	15
AUG.										
05...	1055	A27	120	20	—	—	—	—	—	—
07...	0830	A14	—	—	182	0	74	52	.3	1.4
19...	0830	A13	—	—	218	0	94	118	.3	.7
26...	0830	A10	—	—	192	0	77	90	.3	1.7
SEPT.										
02...	0800	A4.2	—	—	214	0	98	80	.2	1.5
03...	0830	4.4	150	100	—	—	—	—	—	—
11...	0830	A9.5	—	—	186	0	167	105	.4	.8
23...	0830	6.4	—	—	226	0	140	87	.3	3.1

A DAILY MEAN DISCHARGE.

source: (U.S.G.S., 1974)

SCIOTO RIVER BASIN

03228805 ALUM CREEK AT AFRICA, OHIO--Continued

Period of record:
Specific conductance (1965-69): Maximum daily, 1,380 micromhos Feb. 8, 1966; minimum daily, 178 micromhos July 14, 1966.
Water temperatures: Maximum, 35.0°C July 3, 1966; minimum, freezing point on many days during winter periods.

REMARKS.--Samples for iron and manganese were filtered clear when collected. Daily samples were collected at this station and samples were selected for analysis on the following basis: (1) Maximum daily specific conductance for each month, (2) minimum daily specific conductance for each month, (3) median daily specific conductance for each month, and (4) special sample each month to further define the quality of water.

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1968 TO SEPTEMBER 1969

DATE	TOTAL PHOS-PHORUS (PO4) (MG/L)	DIS-SOLVED SOLIDS (RESI-DUE AT 180 C) (MG/L)	HARD-NESS (CA,MG) (MG/L)	NON-CAR-BONATE HARD-NESS (MG/L)	SPECIFIC CON-DUCTANCE (MICRO-MHOS)	PH (UNITS)	TEM-PERA-TURE (DEG C)	DIS-SOLVED OXYGEN (MG/L)	PER-CENT SATUR-ATION
OCT.									
03...	.29	552	405	213	930	7.6	--	—	—
07...	—	—	—	—	—	—	11	7.6	66
15...	.00	610	360	132	1030	7.5	9	—	—
28...	.00	712	500	257	1060	7.6	7	—	—
NOV.									
04...	—	—	—	—	--	—	10	7.4	65
07...	.00	610	490	244	1050	8.0	6	—	—
22...	.32	596	400	220	952	8.0	6	—	—
30...	.10	360	265	167	625	7.2	6	—	—
DEC.									
04...	—	--	--	—	—	—	6	10.2	82
14...	.00	590	375	191	831	7.9	1	—	—
18...	.48	600	445	225	963	7.9	1	—	—
JAN.									
01...	.11	384	290	165	613	8.0	1	—	—
16...	.00	632	470	231	1010	7.7	0	—	—
22...	—	—	—	—	—	—	3	13.6	96
30...	.63	156	95	58	231	7.3	1	—	—
FEB.									
01...	.16	272	160	86	395	7.2	3	—	—
07...	.00	516	300	162	831	7.6	0	—	—
07...	—	--	—	--	—	—	1	13.0	92
14...	.00	484	317	153	720	7.9	1	—	—
MAR.									
07...	.02	510	337	176	770	7.9	2	—	—
18...	—	—	—	—	—	—	10	14.2	126
22...	.25	526	350	189	814	7.6	6	—	—
28...	.13	376	258	141	564	7.4	9	—	—
APR.									
03...	.02	480	278	140	698	7.7	12	—	—
17...	—	—	—	—	—	—	15	8.9	83
19...	.18	190	111	56	281	7.0	7	—	—
MAY									
07...	.00	498	310	144	717	7.5	20	—	—
08...	—	--	—	—	—	—	20	7.4	82
17...	.00	426	275	127	625	7.3	20	—	—
19...	.22	144	82	38	205	7.3	16	—	—
JUNE									
02...	.00	452	315	138	699	7.8	20	—	—
03...	—	—	--	--	—	—	17	6.8	91
05...	.00	476	325	138	744	7.6	18	—	—
23...	.13	248	165	76	383	7.2	18	—	—
JULY									
01...	—	—	—	—	—	—	24	7.4	87
03...	.03	532	366	162	856	8.2	22	—	—
12...	.22	242	154	69	361	7.5	22	—	—
24...	.09	390	256	103	620	7.4	24	—	—
AUG.									
05...	—	--	—	—	—	—	21	7.0	82
07...	.09	348	246	97	550	7.5	22	—	—
19...	.05	526	334	155	875	8.1	23	—	—
26...	.08	436	310	152	712	8.1	21	—	—
SEPT.									
02...	.00	450	322	146	725	7.7	21	—	—
03...	--	--	—	—	—	—	21	5.6	62
11...	.57	568	382	229	966	8.1	15	—	—
23...	.00	504	385	200	843	8.2	17	—	—

10-31-74

BURGESS & NIPLE, LIMITED
Consulting Engineers
Columbus, Ohio 43212

WATER QUALITY LABORATORY - WASTEWATER ANALYSIS

Job Description Delaware County No.
Date Collected 10-31-74 Analyzed By J. Altizer
Date Received 10-31-74 Checked By

Sampling Location	Powell Rd.	County Line	Below TP @ Worth. Hills	I-270
Time				
Sample Number	3886	3887	3888	3889
Temperature - °C	18.2	18.5	20.0	18.0
pH	7.6	7.8	7.7	8.0
BOD, 5 Day - mg/l	2.7	2.7	1.3	2.6
COD, mg/l				
Dissolved Oxygen - mg/l	10.2	10.0	7.4	9.8
Total Solids - mg/l				
Total Solids, % Volatile				
Suspended Solids - mg/l	7	14	10	6
Suspended Solids, % Volatile				
Phosphates, Ortho - mg/l as P				
Phosphates, Total - mg/l as P				
Nitrates - mg/l as N	0.90	0.65	0.00	0.70
Nitrogen, Ammonia, - mg/l as N	0	0	1.4	0
Nitrogen, Organic - mg/l as N	1.4	1.4	2.2	1.7
Chlorine Demand - mg/l as Cl				
Grease and Oils - mg/l				
Alkalinity, Phenol - mg/l as $CaCO_3$				
Alkalinity, Total - mg/l as $CaCO_3$	182	188	348	194
Acidity, Free - mg/l as $CaCO_3$				
Acidity, Total - mg/l as $CaCO_3$				
Hardness - mg/l as $CaCO_3$				
Calcium - mg/l as $CaCO_3$				
Chlorides - mg/l as Cl	54.2	57.5	40.4	66.0
Sulfates, mg/l as SO_4				
Sodium, mg/l as Na				
Specific Conductance - umho/cm	570	570	1525	630
Turbidity - JTU	7	13	13	11

Burgess and Niple, December, 1974.

BURGESS & NIPLE, LIMITED
Consulting Engineers
Columbus, Ohio 43212

WATER QUALITY LABORATORY - WASTEWATER ANALYSIS

Job Description Delaware County No.
Date Collected 10-31-74 Analyzed By J. Altizer
Date Received 10-31-74 Checked By

Sampling Location	Powell Rd.	County Line	Below T.P. @ Worth. Hills	I-270	
Time					
Sample Number	3886	3887	3888	3889	
Cyanide -	6	6	7	8	
Phenol - mg/l					
Silica -					
Aluminum - mg/l					
Cadmium - mg/l	<.001	<.001	<.001	<.001	
Chromium, total - mg/l	<.020	<.020	.031	<.020	
Chromium, hexavalent - mg/l					
Copper - mg/l	<.025	<.025	.058	<.025	
Iron - mg/l					
Lead - mg/l					
Magnesium - mg/l					
Manganese - mg/l					
Nickel - mg/l					
Potassium - mg/l					
Silver - mg/l					
Tin - mg/l					
Zinc - mg/l	<.020	.060	.080	<.020	
Coliform, Fecal count/100 ml.	94	110	2400	66	
Coliform, total					
Fecal streptococci count/100 ml.	26	180	6500	38	

Reproduced from best available copy.

11-25-74

BURGESS & NIPLE, LIMITED
Consulting Engineers
Columbus, Ohio 43212

WATER QUALITY LABORATORY - WASTEWATER ANALYSIS

Job Description Delaware County
No. 3175
Date Collected [illegible]
Analyzed By J. Altizer
Date Received 11-25-74
Checked By

Sampling Location	Olentangy R at Powell Road	Olentangy R at County Line	Olentangy R below Worth. Hills	Olentangy R at I-270
Time				
Sample Number	3925	3926	3927	3928
Temperature - °C	4.5	4.5	6.0	6.0
pH	7.7	7.6	7.6	7.6
BOD, 5 Day - mg/l	1.1	1.3	1.0	1.6
COD, mg/l				
Dissolved Oxygen - mg/l	12.4	12.4	12.1	12.4
Total Solids - mg/l				
Total Solids, % Volatile				
Suspended Solids - mg/l	31	33	37	35
Suspended Solids, % Volatile				
Phosphates, Ortho - mg/l as P	0.08	0.09	0.22	0.10
Phosphates, Total - mg/l as P	0.18	0.18	0.39	0.15
Nitrates - mg/l as N	5.2	4.85	4.9	5.2
Nitrogen, Ammonia, - mg/l as N	0	0	0	0
Nitrogen, Organic - mg/l as N	1.7	1.7	0	0
Chlorine Demand - mg/l as Cl				
Grease and Oils - mg/l				
Alkalinity, Phenol - mg/l as $CaCO_3$				
Alkalinity, Total - mg/l as $CaCO_3$	152	154	162	152
Acidity, Free - mg/l as $CaCO_3$				
Acidity, Total - mg/l as $CaCO_3$				
Hardness - mg/l as $CaCO_3$				
Calcium - mg/l as $CaCO_3$				
Chlorides - mg/l as Cl	41.8	40.9	52.3	40.9
Sulfates, mg/l as SO_4				
Sodium, mg/l as Na				
Specific Conductance - umho/cm				

BURGESS & NIPLE, LIMITED
Consulting Engineers
Columbus, Ohio 43212

WATER QUALITY LABORATORY - WASTEWATER ANALYSIS

Job Description Delaware County
No. 3175
Date Collected 11-25-74
Analyzed By J Altizer
Date Received 11-25-74
Checked By

Sampling Location					
Time					
Sample Number	3925	3926	3927	3925	
Cyanide - µg/l	< 3	< 3	< 3	< 3	
Phenol - mg/l					
Silica -					
Aluminum - mg/l					
Cadmium - mg/l	< 0.001	< 0.001	< 0.001	< 0.001	
Chromium, total - mg/l	< 0.02	< 0.02	< 0.02	< 0.02	
Chromium, hexavalent - mg/l					
Copper - mg/l	0.02	< 0.02	< 0.02	< 0.02	
Iron - mg/l					
Lead - mg/l					
Magnesium - mg/l					
Manganese - mg/l					
Nickel - mg/l					
Potassium - mg/l					
Silver - mg/l					
Tin - mg/l					
Zinc - mg/l	0.045	0.040	0.050	0.055	
Coliform, Fecal COUNT PER 100 ML	1500	1700	4200	1000	
Coliform, total					
Fecal streptococci COUNT PER 100 ML	4900	2900	6100	3200	

11-7-'74

BURGESS & NIPLE, LIMITED
Consulting Engineers
Columbus, Ohio 43212

WATER QUALITY LABORATORY - WASTEWATER ANALYSIS

Job Description Delaware County No.
Date Collected 11-7-74 Analyzed By J Altizer
Date Received 11-7-74 Checked By

Sampling Location	Olentangy River at Powell Rd.	Olentangy River at County Line	Olentangy River below WWTP Disch.	Olentangy River at I-270 Bridge	Stream
Time					
Sample Number	3898	3999	3900	3901	3902
Temperature - °C	10.5	10.5	11.5	11.0	8.8
pH	7.8	7.7	7.6	7.6	8.1
BOD, 5 Day - mg/l	2.3	3.1	12.7	4.0	1.4
COD, mg/l					
Dissolved Oxygen - mg/l	10.6	10.3	10.2	10.7	11.7
Total Solids - mg/l					
Total Solids, % Volatile					
Suspended Solids - mg/l	49	60	65	41	—
Suspended Solids, % Volatile					
Phosphates, Ortho - mg/l as P	0.05	0.04	0.45	0.04	—
Phosphates, Total - mg/l as P	0.11	0.11	1.16	0.11	—
Nitrates - mg/l as N	0.3	0.3	0.3	0.4	0.6
Nitrogen, Ammonia, - mg/l as N			1.7		
Nitrogen, Organic - mg/l as N	0.3	0.3	3.4	0.3	0.6
Chlorine Demand - mg/l as Cl					
Grease and Oils - mg/l					
Alkalinity, Phenol - mg/l as $CaCO_3$					
Alkalinity, Total - mg/l as $CaCO_3$	162	164	190	162	—
Acidity, Free - mg/l as $CaCO_3$					
Acidity, Total - mg/l as $CaCO_3$					
Hardness - mg/l as $CaCO_3$					
Calcium - mg/l as $CaCO_3$					
Chlorides - mg/l as Cl	51.8	52.7	73.2	53.2	—
Sulfates, mg/l as SO_4					
Sodium, mg/l as Na					
Specific Conductance - umho/cm					

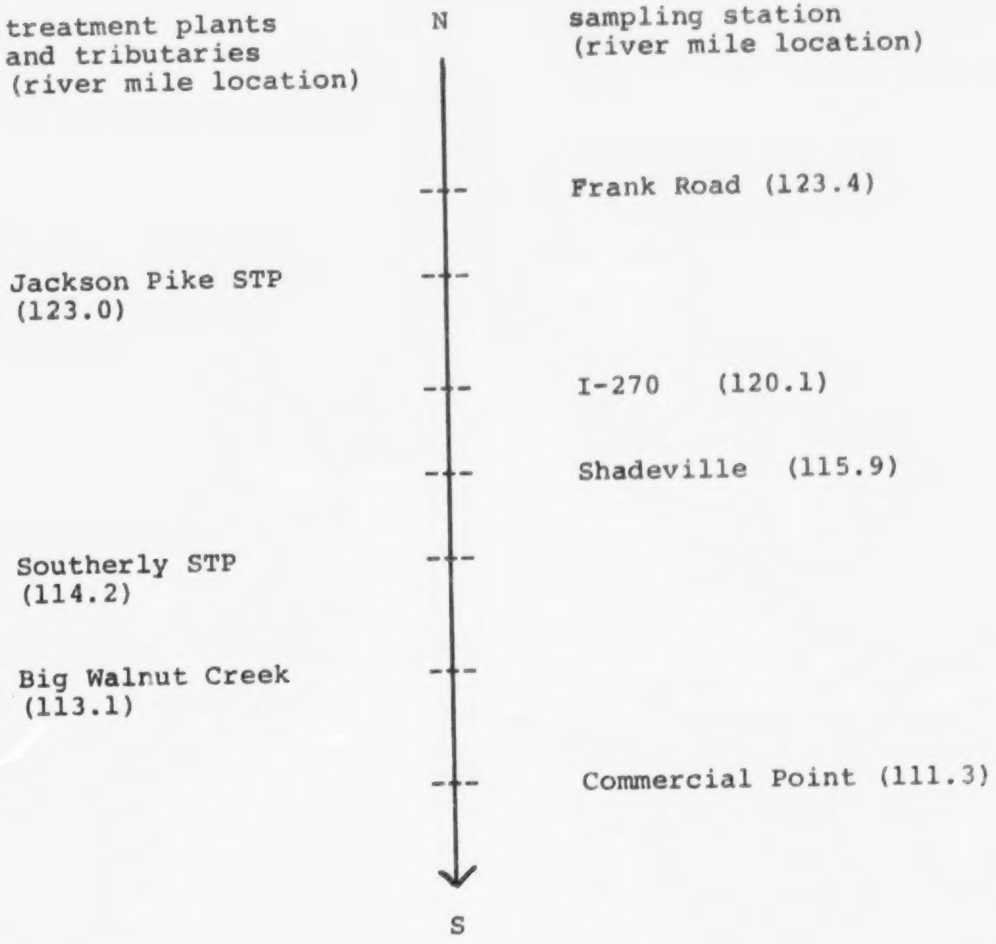
BURGESS & NIPLE, LIMITED
Consulting Engineers
Columbus, Ohio 43212

WATER QUALITY LABORATORY - WASTEWATER ANALYSIS

Job Description Delaware County No.
Date Collected 11-7-74 Analyzed By J Altizer
Date Received 11-7-74 Checked By

Sampling Location					
Time					
Sample Number	3898	3899	3900	3901	
Cyanide - µg/l	< 3	< 3	< 3	< 3	
Phenol - mg/l					
Silica -					
Aluminum - mg/l					
Cadmium - mg/l	<.001	<.001	<.001	<.001	
Chromium, total - mg/l	<.020	<.020	.17	<.020	
Chromium, hexavalent - mg/l					
Copper - mg/l	<.025	<.025	.40	<.025	
Iron - mg/l					
Lead - mg/l					
Magnesium - mg/l					
Manganese - mg/l					
Nickel - mg/l					
Potassium - mg/l					
Silver - mg/l					
Tin - mg/l					
Zinc - mg/l	.020	.040	.46	<.020	
Coliform, Fecal count/100 ml.	400	700	400,000	1,900	
Coliform, total					
Fecal streptococci count/100 ml.	2,000	2,300	68,000	1,900	
Turbidity - JTU	28	43	41	31	

Scioto River--Selected Water Quality Sampling Stations



Source: State of Ohio Annual Water Quality Report, 1975.

Frank Road

Parameter	Units	Oct. 73	Nov. 73	Dec. 73	Jan. 74	Feb. 74	Mar. 74	Apr. 74	May 74	June 74	July 74	Aug. 74	Sept. 7
Temperature	C	18.75	10.8		2.0	4.0	8.7	11.5	19.1	20.6	25.2		19.9
Conductivity	umhos	466.	529		316	510	475	320	563	581	710		580
Dissolved O_2	mg/l	6.9	10.0		11.6	11.9	10.7	10.1	7.5	5.7	8.3		7.1
BOD_5	mg/l	3.8	3.7		3.2	3.7	2.3	3.3	5.3	6.6	11.7		3.1
pH	S.U.	7.7	7.7		7.6	7.7	7.8	7.7	7.9	7.8	7.7		7.5
T. Alkalinity	mg/l	171	200		113	165	150	135	180	192	192		147
Ammonia - N	mg/l	.59	.38		.47	.47	.35	.47	.43	.45	.19		.53
Nitrite	mg/l	.12	.06		.06	.08	.11	.03	.11	.20	.02		.17
Nitrate	mg/l	.31	1.06		3.49	2.86	3.06	2.44	1.12	.91	.13		.44
T. Phosphorus	mg/l	.56	.81		.85	.53	.44	.72	.11	.48	.61		.53
Chloride	mg/l	36	37		23	44	30	21	38.0	39	55		48.0
T. Cadmium	ug/l								---	0	---		---
T. Chromium	ug/l								0	28.0	0		0
T. Cobalt	ug/l								---	0	---		---
T. Copper	ug/l								0	20.0	0		0
T. Iron	ug/l								---	1650.	---		---
T. Lead	ug/l								25.0	85.0	0		0
T. Manganese	ug/l								---	100.0	---		---
T. Nickel	ug/l								0	55.0	0		0
T. Zinc	ug/l								---	215.0	---		---
Fecal Coliform	#/100ml								610	42.760	100		56
Ortho Phosphate	mg/l								---	---	---		---

I-270

Parameter	Units	Oct. 73	Nov. 73	Dec. 73	Jan. 74	Feb. 74	Mar. 74	Apr. 74	May 74	June 74	July 74	Aug. 74	Sept. 74
Temperature	C	19.5	11.4		4.0	4.5	8.7	11.5	18.7	20.1	25.0		20.3
Conductivity	umhos	745	616		337	545	497	350	647	710	930		770
Dissolved O_2	mg/l	3.0	8.5		11.5	11.5	10.2	9.9	6.6	4.1	3.5		3.3
BOD_5	mg/l	6.2	8.4		7.0	7.3	4.9	4.0	8.5	11.3	16.3		5.3
pH	S.U.	7.5	7.6		7.6	7.7	7.7	7.8	7.8	7.3	7.4		7.3
T. Alkalinity	mg/l	180	0.87		122	165	158	115	197	200	210		165
Ammonia - N	mg/l	11.13	6.50		149	1.52	1.44	0.90	3.44	5.81	10.21		7.39
Nitrite - N	mg/l	0.31	0.30		0.14	0.11	0.14	0.10	0.29	0.41	0.50		0.43
Nitrate - N	mg/l	.08	0.92		3.81	2.68	3.03	2.56	1.06	1.13	0.30		0.34
T. Phosphorous	mg/l	2.2	2.28		1.24	1.02	0.74	0.76	1.60	1.80	3.46		2.86
Chloride	mg/l	57	49.2		27	46	34	23	42	41.3	75		65
T. Cadmium	ug/l									0.0			
T. Chromium	ug/l									25.0			
T. Cobalt	ug/l									0.0			
T. Copper	ug/l									30.0			
T. Iron	ug/l									770.0			
T. Lead	ug/l									70.0			
T. Manganese	ug/l									100.0			
T. Nickel	ug/l									45.0			
T. Zinc	ug/l									155.0			
Fecal Coliform	#/100ml												
O-Phosphate	mg/l									1.61			

Shadeville

Parameter	Units	Oct. 73	Nov. 73	Dec. 73	Jan. 74	Feb. 74	Mar. 74	Apr. 74	May 74	June 74	July 74	Aug. 74	Sept. 74
Temperature	C	18.8	11.4		4.33	4.5	9.0	11.5	18.7	20.0	24.1		20.0
Conductivity	umhos	741	618		260	525	517	370	650	705	910		715
Dissolved O_2	mg/l	2.9	7.5		11.1	11.5	9.7	9.9	4.3	2.7	2.5		2.5
BOD_5	mg/l	4.5	8.7		7.4	9.2	6.2	4.4	10.7	9.7	18.3		6.5
pH	S.U.	7.4	7.6		7.6	7.6	7.6	7.7	7.6	7.2	7.4		7.3
T. Alkalinity	mg/l	185	188		116	175	151	110	190	205	302		162
Ammonia - N	mg/l	9.60	5.74		1.59	1.23	1.5	.82	3.77	5.0	8.7		6.21
Nitrite - N	mg/l	0.42	0.26		0.26	0.15	0.16	.09	.41	.49	.71		.70
Nitrate - N	mg/l	0.09	0.65		3.70	2.86	2.9	2.5	1.03	1.37	.53		.44
T. Phosphorous	mg/l	2.1	2.06		1.26	1.09	0.79	.84	1.64	1.6	2.4		2.67
Chloride	mg/l	68	49		28	48	35	24	49	53	69		64
T. Cadmium	ug/l												
T. Chromium	ug/l												
T. Cobalt	ug/l												
T. Copper	ug/l												
T. Iron	ug/l												
T. Lead	ug/l												
T. Manganese	ug/l												
T. Nickel	ug/l												
T. Zinc	ug/l												
Fecal Coliform	#/100ml												
O-Phosphate	mg/l												

Commercial Point

Parameter	Units	Oct. 73	Nov. 73	Dec. 73	Jan. 74	Feb. 74	Mar. 74	Apr. 74	May 74	June 74	July 74	Aug. 74	Sept. 74
Temperature	C	19.2	12.5		5.1	4.5	10.2	12.5	19.2	21.1	25.3		21.0
Conductivity	umhos	676	415		351	510	510	370	647	665	847		620
Dissolved O_2	mg/1	3.3	7.7		11.1	11.0	9.3	8.9	5.3	3.7	1.1		1.2
BOD_5	mg/1	8.4	8.8		6.8	11.3	6.4	4.9	11.2	10.7	16.1		8.7
pH	S.U.	7.6	7.5		7.6	7.6	7.6	7.6	7.6	7.2	7.3		7.3
T. Alkalinity	mg/1	201	172		120	160	152	120	195	200	242		175
Ammonia - N	mg/1	9.29	3.23		.68	2.00	1.40	1.0	2.88	4.17	8.2		6.26
Nitrite - N	mg/1	.37	.21		.11	.13	.18	.11	.53	.47	.53		.54
Nitrate - N	mg/1	.31	.65		3.10	2.02	2.42	2.23	1.38	1.50	.28		.25
T. Phosphorous	mg/1	2.20	1.85		.97	1.02	.70	.76	1.42	1.85	2.98		2.35
Chloride	mg/1	48	41		30	55	37	25	48	49	62		53
T. Cadmium	ug/1									5.0			
T. Chromium	ug/1									75.0			
T. Cobalt	ug/1									.00			
T. Copper	ug/1									25.0			
T. Iron	ug/1									1250.0			
T. Lead	ug/1									65.0			
T. Manganese	ug/1									120.0			
T. Nickel	ug/1									40.0			
T. Zinc	ug/1									260.0			
Fecal Coliform	#/100ml									1.56			
O-Phosphate	mg/1												

Appendix C Biology

part 1. Plants of Flint Ravine and Highbanks

TREES

Salicaceae - willow family
- Salix longifolia
  - " discolor
  - " nigra
  - " sericea
- Populus deltoides

Betulaceae - birch family
- Ostrya virginiana
- Carpinus caroliniana

Urticaceae - nettle family
- Ulmus fulva
  - " americana
  - " racemosa
- Celtis occidentalis
- Morus rubra

Rosaceae - rose family
- Amalanchier canadensis
- Prunus serotina

Leguminosae - legume family
- Gleditsia triacanthos
- Cercis canadensis
- Robinia pseudo-acacia

Oleaceae - olive family
- Fraxinus americana
  - " quadrangulata

Juglandaceae - walnut family
- Juglans nigra
  - " cinerea
- Carya ovata
  - " glabra
  - " cordiformis

Fagaceae - beech family
- Fagus grandifolia
- Quercus alba
  - " macrocarpa
  - " muhlenbergia
  - " rubra
  - " velutina

Aceraceae - maple family
- Acer saccharum
  - " saccharinum
  - " rubrum
  - " nigrum
  - " negundo

Sapindaceae - soapberry family
- Aesculus glabra

Tiliaceae - Linden family
- Tilia americana

Cornaceae - dogwood family
- Cornus florida

Platanaceae - plane tree family
- Platanus occidentalis

SHRUBS

Asimina triloba
Benzoin aestivale
Cornus paniculata
Diervilla diervilla
Evonymus atropurpurea
Gaylussacia baccata
Hammamelis virginiana
Juniperus virginiana
Ribes cynosbati
Viburnum prunifolium
Viburnum acerifolium
Rhus toxicodendron

Rhus glabra
Staphylea trifoliata
Sambucus canadensis
Smilax glauca
Smilax hispida
Smilax rotundifolia
Rubus allegheniensis
Rubus occidentalis
Rubus villusus
Vaccinium pennsylvanicum
Psedera quinquefolia
Vitis cordifolia

Source: Burgess and Niple, 1974.

Reproduced from best available copy.

HERBS

Pteridophytes
Polyopdium virginianum
Adiantum pedatum
Aspidium marginale
Polystichum acrostichoides
Equisetum arvense

Graminea - grass family
Andropogon furcatus
" scoparius
Digitaria sanguinalis
Panicum virgatum
" autumnale
Setaria glauca
Agrostis alba
Danthonia spicata
Dactylis glomerata
Poa compressa
Poa pratensis
Glyceria nervata
Elymus candensis
Hystrix hystrix

Cyperaceae - sedge family
Cyperus strigosus
" erythrorhizos
Scirpus americanus
Carex straminea
" sparganioides
" vulpinoidea
" jamesii
" pennsylvanica
" plantaginea
" platyphylla
" laxiflora
" grayii
" hystericinum
" frankii
" tribuloides

Juncaceae - rush family
Juncus effusus
" tenuis

Liliaceae - lily family
Uvularia perfoliata
Allium tricoccum
" cernuum
Erythronium americanum
" albidum
Smilacina racemosa
Polygonatum biflorum
" commutatum
Trillium sessile

Amaryllidaceae (Amaryllis family)
Hypoxis hirsuta

Iridaceae - Iris family
Iris virginica
Sisyrinchium graminoides

Urticaceae - Nettle family
Urtica gracilis
" dioica
Laportea canadensis
Pilea pumila
Boehmeria cylindrica
Parietaria pennsylvanica

Santalaceae - Sandalwood family
Comandra umbellata

Aristolochiaceae - Birthwort family
Asarum canadense

Polygonaceae - Buckwheat family

Rumex crispus
" altissimus
" obtusifolius
Polygonum aviculare
" acre
" convulvulus
" virginicum

Chenopodiaceae - Goosefoot family

Chenopodium album
Atriplex patula

Amaranthaceae - amaranth family
Amaranthus retroflexus

Caryophyllaceae - pink family
Stellaria media
Cerastium arvense
Silene antirrhina
Saponaria officinalis

Portulacaceae - purslane family
Claytonia virginica

Ranunculaceae - crowfood family
Ranunculus recurvatus
" fascicularis
" septentrionalis
" abortivus

Trillium grandiflorum
" cernuum
Smilax herbacea

Hepatica acutiloba
Anemone quinquefolia
" canadensis
Isopyrum biternatum
Actaea alba

Berberidaceae - barberry family
Podophyllum peltatum
Jeffersonia diphylla
Caulophyllum thalictroides

Papaveraceae - poppy family
Sanguinaria canadensis

Fumariaceae - Fumitory family
Dicentra cucullaria
" canadensis
Corydalis flavula

Cruciferae - mustard family
Lepidium virginicum
" campestre
Capsella bursa pastoris
Brassica nigra
Sisymbrium altissimum
Barbarea vulgaris
Iodanthus pinnatifidus
Dentaria laciniata
Cardamine bulbosa
" douglassii
Arabis lyrata
" laevigata

Saxifragaceae - Saxifrage family
Heuchera americana
Mitella diphylla

Rosaceae - Rose family
Fragaria virginiana
Potentilla canadensis
Geum canadense
" vernum

Leguminosae-Pulse family
Trifolium pratense
" repens
Lespedeza angustifolia
Melilotus officinalis
" alba
Medicago sativa
Amphicarpa monoica

Thalictrum dioicum
" dasycarpum
Anemonella thalictroides
Hepatica triloba
Euphorbiaceae - spurge family
Acalypha virginica

Violaceae - violet family
Hybanthus concolor
Viola cucullata
" sororia
" pallens
" pubescens
" scabriuscula
" rostrata

Onagraceae - Evening primrose family
Oenothera biennis
Circaea lutetiana

Umbelliferae - Parsley family
Sanicula marilandica
" trifoliata
Erigenia bulbosa
Chaerophyllum procumbens
Osmorrhiza claytoni
" longistylis
Cryptotaenia canadensis
Zizia aurea
Angelica atropurpurea
Daucus carota
Heracleum lanatum
Pastinaca sativa
Taenidia integerrima

Hypericaceae - St John's Wort family
Hypericum punctatum
" perforatum

Primulaceae - Primrose family
Lysimachia nummularia
Steironema ciliatum

Apocynaceae - Dogbane family
Apocynum cannabinum

Asclepiadaceae - Milkweed family
Asclepias syriaca
Asclepias quadrifolia

Polemoniaceae - Polemonium family
Phlox divaricata
" maculata
Polemonium reptans

Hydrophyllaceae - Waterleaf family
Hydrophyllum macrophyllum
" appendiculatum

Oxalidaceae - Wood sorrel family
Oxalis corniculata
" stricta

Geraniaceae - Geranium family
Geranium maculatum
Erodium cicutarium

Verbenaceae - Vervain family
Verbena stricta
Lippia lanceolata

Labiatae - Mint Family
Teucrium canadense
Nepeta cataria
" hederacea
Prunella vulgaris
Lamium amplexicaule
Leonurus cardiaca
Monarda fistulosa
Hedeoma pulegioides
Mentha spicata
Mentha piperita
Lycopus americanum
Blephilia hirsuta

Solanaceae - Nightshade family
Solanum dulcamara
" nigrum
Datura stramonium

Scrophulariaceae - Figwort family
Verbascum thapsus
Verbascum blattaria
Penstemon hirsutus
Mimulus ringens
Veronica peregrina
" arvensis
Pedicularis canadensis

Acanthaceae - Acanthus family
Dianthera americana
Plantaginaceae - Plantain family
Plantago lanceolata
" major

Rubiaceae - Madder family
Galium aparine
" circaezans
" concinnum
" asprellum
Mitchella repens
Houstonia caerulea

Boraginaceae - Borage family
Mertensia virginica
Lithospermum arvense

[illegible]

Cucurbitaceae - Gourd family
Sicyos angulatus
Echinocystis lobata

Campanulaceae - Bluebell family
Specularia perfoliata
Campanula americana

Compositae - Composite family
Vernonia altissima
Eupatorium pupureum
" perfoliatum
" urticaefolium
Solidago nemoralis
Solidago flexicavlis
Solidago caesia
Aster lateriflorus
" macrophyllus
" ericoides
Erigeron annuus
" philadelphius
Antennaria plantaginifolia
Ambrosia trifida
" artemisiifolia
Xanthium canadense
Rudbeckia laciniata
Actinomeris alternifolia
Bidens frondosa
Helianthus diuaricatus
Achilles millefoliuk
Anthemis cotula
Senecio aureus
Arctium lappa
Tarogopogon pratensis
Taraxacum officinale
Sonchus asper
Lactuca scariola

Prenanthes alba
" crepidinea
" trifoliata

part 2. Endangered Wildflowers at Highbanks Park

Jack-in-the-pulpit	*Arisaema triphyllum*
Canada Lily	*Lilium canadense*
Indian Cucumber-root	*Medeola virginiana*
Showy Orchis	*Orchis spectabilis*
Fringed Orchids	*Habenaria* spp.
Ladies' Tresses	*Spiranthes* spp.
Twayblade Orchids	*Liparis* spp.
Coral-root Orchids	*Corallorhiza* spp.
Ginseng	*Panax quinquefolium*
Rose-pink Gentian	*Sabatia angularis*
Virginia Bluebells	*Mertensia virginica*
Partridge Berry	*Mitchella repens*
White Baneberry	*Actaea pachypoda*
Club Moss	*Lycopodium* spp.

These are from the Ohio State list of Endangered Species.

part 3. Animals of Franklin County

Amphibians and Reptiles of Franklin County

Amphibians

Salamanders

Mudpuppy
  Necturus m. maculosus
Red-spotted Newt
  Triturus v. viridescens
Jefferson's Salamander
  Ambystoma jeffersonianum
Spotted Salamander
  Ambystoma maculatum
Marbled Salamander
  Ambystoma opacum
Tiger Salamander
  Ambystoma t. tigrinum
Dusky Salamander
  Desmognathus fuscus
Red-backed Salamander
  Plethodon cinereus
Slimy Salamander
  Plethodon g. glutinosus
4 Toed Salamander
  Hemidactylium scutatum

Frogs and Toads

American Toad
  Bufo terristris americanus
Fowlers Toad
  Bufo woodhousii fowleri
Eastern Treefrog
  Hyla v. versicolor

Spring Peeper
  Hyla c. crucifer
Chorus Frog
  Pseudoacris nigrita triseriata
Cricket Frog
  Acris crepitans
Leopard Frog
  Rana pipiens
Pickerel Frog
  Rana palustris
Wood Frog
  Rana sylvatica
Bull Frog
  Rana catesbeiana
Green Frog
  Rana clamitans

Reptiles

Turtles

Snapping Turtle
  Chelydra s. serpentina
Painting Turtle
  Chrysemys picta marginata
Box Turtle
  Terrapene c. carolina
Musk Turtle
  Sternotherus odoratus
Map Turtle

Spiny Softshelled Turtle
  Amyda s. spinifera

Lizards

5 lined skink

Snakes

Black Racer
  Coluber c. constrictor
Black Rat Snake

Milk Snake
  Lampropeltis doliata triangulum
Garter Snake
  Thamnophis s. sirtalis
Water Snake
  Natrix s. sirtalis
Brown Snake

Queen Snake
  Natrix septemvittata
Hog-nosed Snake
  Heterodon p. platyrhinos

Source: Good, E. E., Ohio State University

In: Malcolm Pirnie, 1975.

Mammals of Franklin County

Farm Land Species

Cottontail rabbit
Sylvilagus floridanus[1]

Fox squirrel
Sciurus niger[3]

Racoon
Procyon lotor[2]

Red fox
Vulpes fulva[2]

Woodchuck
Marmota monax[1]

Weasels
Mustella frenata[3]
Mustella rixosa[3]

Opossum
Didelphis virginiana[2]

Shrews
Blarina brevicauda[1]
Cryptotis parvus[3]
Sorex cinerus[2]

Skunk
Mephitis mephitis[2]

Bats
Myotis lucifugus[2]
Pipistrellus subflavus[2]
Epitesicus fuscus[1]
Lasiurus borealis[2]
Lasiurus cinereus[3]
Nycticeius humeralis[3]

Chipmunk
Tamais striatus[1]

Common rat
Rattus norvegicus[2]

Moles
Parascalops breweri[2]
Scalopus aquaticus[2]

Ground squirrel
Citellus tridecemlineatus[1]

Mice
Zapus hudsonicus[3]
Microtus pennsylvanicus[1]
Peromyscus maniculatus[3]
Peromyscus leucopus[1]
Mus musculus[1]

Forest Land Species

White-tailed deer
Odocoileus virginianus[2]

Gray squirrel
Sciurus carolinensis[1]

Gray fox
Urocyon cinereoargentus[3]

Red squirrel
Tamiasciurus hudsonicus[2]

Flying squirrel
Glaucomys volans[2]

Wetland Species

Muskrat
Ondatra zibethicus [2]

Mink
Mustela vison[3]

Bog lemming
Synaptomys cooperi[3]

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1 = abundant: easily seen or found in proper habitat.

2 = common: frequently seen or found in proper habitat.

3 = uncommon: seen or found in proper habitat only occasionally or very infrequently.

Sources: Good, E. E., Ohio State University.
Ohio Department of Natural Resources.

Waterfowl and Shore Birds

- Ducks, geese, swans
  - Wood duck
    - *Aix sponsa**
  - Mallard duck
    - *Anas platyrhynchos**
  - Black duck
    - *Anas rubripes**
  - Lesser scaup
    - *Aythya affinis*•
  - Common goldeneye
    - *Bucephala clangula*•
  - Ring-necked duck
    - *Aythya collaris*•
  - Bufflehead duck
    - *Bucephala albeola*•
  - Redhead duck
    - *Aythya americana*•
  - American widgeon duck
    - *Marcea americana*•
  - Gadwell duck
    - *Anas strepera*•
  - Shoveler duck
    - *Spatula clypeata*•

- American coot
  - *Fulica americana*•
- Ring-necked grebe
  - *Podiceps grisegena*•
- Horned grebe
  - *Podiceps auritus*•
- Pied-billed grebe
  - *Podilymbus podiceps*•
- Common loon
  - *Gavia immer*•
- Double-crested cormorant
  - *Phalacrocorax auritus*•
- Great blue heron
  - *Ardea herodias**
- Green heron
  - *Butorides virescens**
- Little blue heron
  - *Florida caerulea*•
- Common egret
  - *Casmerodius albus*•
- Snowy egret
  - *Leucophoyx thula*•
- Virginia rail
  - *Rallus limicola*•

- Blue-winged teal
  - *Anas discors**
- Green-winged teal
  - *Anas carolinensis*•
- Canvasback
  - *Aythya valisneria*•
- Whistling swan
  - *Olor columbianus*•
- Snow goose
  - *Chen hyperborea*•
- Blue goose
  - *Chen caerulescens*•
- Canada goose
  - *Branta canadensis**
- Hooded merganser
  - *Lophodytes cullatus*•
- Common merganser
  - *Mergus merganser*•
- Red-breasted merganser
  - *Mergus serrator*•
- Pintail duck
  - *Anas acuta*•
- Ruddy duck
  - *Oxyura jamaicensis*•

- Belted kingfisher
  - *Megaceryle alcyon**
- Bonapart's gull
  - *Larus philadelphia*•
- Herring gull
  - *Larus argentatus*•
- Black tern
  - *Chlidonias niger*•
- Caspian tern•
  - *Hydroprogne caspia*•
- Common tern
  - *Sterna hirundo*•E
- Killdeer
  - *Charadris vociferus**
- Sandpipers
  - Several species•
- Least bittern
  - *Ixobrychus exilis*•
- American bittern
  - *Botaurus lentiginosus*•
- King rail
  - *Rallus elegans*•E
- Ring-billed gull
  - *Larus delawarensis*•

Birds of Prey

- Hawks
  - Sharp-shinned hawk
    - *Accipiter striatus velox*•E
  - Cooper's hawk
    - *Accipiter cooperii**
  - Red-tailed hawk
    - *Buteo jamaicensis**
  - Marsh hawk
    - *Circus cyaneus**
  - Sparrow hawk
    - *Falco sparverius**
  - Red-shouldered hawk
    - *Buteo lineatus**
  - Broad-winged hawk
    - *Buteo platypterus*•
  - Rough-legged hawk
    - *Buteo lagopus*•
  - Osprey
    - *Pandion haliaetus*•
  - Bald eagle
    - *Haliaeetus leucocephalus*•EE

- Owls
  - Barn owl
    - *Tyto alba**
  - Long-eared owl
    - *Asio otus*•
  - Short-eared owl
    - *Asio flammeus**
  - Saw whet owl
    - *Aegolius acadicus*•
  - Screech owl
    - *Otus asio**
  - Great horned owl
    - *Bubo virginianus**
  - Barred owl
    - *Strix varia**

- Vultures
  - Turkey vulture
    - *Cathartes aura**
  - Black vulture
    - *Coragyps atratus*

Upland Game Birds

- Ring-necked pheasant
  - *Phasianus colchicus**

- Bob-white quail
  - *Colinus virginianus mexicanus**

- Woodcock
  - *Philohela minor**

* Nest
• Migrants
E Endangered Species (Ohio DNR)
EE Endangered Species (Ohio DNR and U.S. Dep't. Interior)
Source: Good, E. E., Ohio State University

Part 4. Highbanks Park Animals and Birds

AMPHIBIANS, REPTILES, AND MAMMALS OF HIGHBANKS METROPOLITAN PARK

AMPHIBIANS

*Jefferson Salamander (Ambystoma jeffersonianum)
*Small-mouthed Salamander (Ambystoma texanum)
*Spotted Salamander (Ambystoma maculatum)
Northern Dusky Salamander (Desmognathus fuscus)
Red-backed Salmander (Plethodon cinereus)
Northern Two-lined Salamander (Eurycea bislineata)
*Long-tailed Salamander (Eurycea longicauda)
American Toad (Bufo americanus)
Fowler's Toad (Bufo woodhousei)
Spring Peeper (Hyla crucifer)
Gray Treefrog (Hyla versicolor)
Western Chorus Frog (Pseudacris triseriata)
Cricket Frog (Acris crepitans)
Bullfrog (Rana catesbeiana)
Green Frog (Rana clamitans)
Northern Leopard Frog (Rana pipiens)
Pickerel Frog (Rana palustris)
*Wood Frog (Rana sylvatica)

REPTILES

Five-lined Skink (Eumeces fasciatus)
Snapping Turtle (Chelydra serpentina)
Stinkpot Turtle (Sternothaerus odoratus)
Eastern Box Turtle (Terrapene carolina)
Map Turtle (Graptemys geographica)
Midland Painted Turtle ([illegible])
Eastern Spiny Softshell Turtle (Trionyx spinifer)
Northern Black Racer (Coluber constrictor)
Blue Racer (Coluber constrictor foxi)
Northern Water Snake (Natrix sipedon)
Queen Snake (Natrix septemyittata)
Eastern Milk Snake (Lampropeltis doliata)
Northern Brown Snake (Storeria dekayi)
Eastern Garter Snake (Thamnophis sirtalis)
Black Rat Snake (Elaphe obsoleta)
*Northern Ringneck Snake (Diadophis punctuatus)
*Eastern Hognose Snake (Heterodon platyrhinos)

MAMMALS

Virginia Opossum (Didelphis virginiana)
Short-tailed Shrew (Blarina brevicauda)
Least Shrew (Cryptotis parva)
Eastern Mole (Scalopus aquaticus)
Little Brown Bat (Myotis lucifugus)
*Silver-haired Bat (Lasionycteris noctivagans)
*Pygmy Bat (pipistrellus subflavus)
Big Brown Bat (Epitesicus fuscus)
Red Bat (Lasiurus borealis)
Hoary Bat (Lasiurus cinereus)
Raccoon (Procyon lotor)
*Longtail Weasel (Mustela frenata)
Mink (Mustela vison)
Striped Skunk (Mephitis mephitis)
Red Fox (Vulpes fulva)

Source: Metropolitan Park District of Columbus and Franklin County

Gray Fox (*Urocyon cinereoargenteus*)

Woodchuck (*Marmota monax*)

Eastern Chipmunk (*Tamias striatus*)

Red Squirrel (*Tamiasciurus hudsonicus*)

Gray Squirrel (*Sciurus carolinensis*)

Fox Squirrel (*Sciurus niger*)

Southern Flying Squirrel (*Glaucomys volans*)

Prairie Deer Mouse (*Peromyscus maniculatus*)

White-footed Mouse (*Peromyscus leucopus*)

*Southern Bog Lemming (*Synaptomys cooperi*)

Meadow Vole (*Microtus pennsylvanicus*)

*Pine Vole (*Pitymys pinetorum*)

Muskrat (*Ondatra zibethica*)

House Mouse (*Mus musculus*)

Norway Rat (*Rattus norvegicus*)

Meadow Jumping Mouse (*Zapus hudsonius*)

Eastern Cottontail Rabbit (*Sylvilagus floridanus*)

Whitetail Deer (*Odocoileus virginianus*)

*Within the range, but not observed by Park District staff.

BIRDS OCCURRING REGULARLY AT HIGHBANKS METROPOLITAN PARK

Grebes

Horned Grebe (*Podiceps auritus*)

Pied-billed Grebe (*Podilymbus podiceps*)

Herons

Great Blue Heron (*Ardea herodias*)

Green Heron (*Butorides virescens*)

Least Bittern (*Ixobrychus exilis*)

Geese and Ducks

Canada Goose (*Branta canadensis*)

Mallard (*Anas platyrhynchos*)

Black Duck (*Anas rubripes*)

Gadwall (*Anas strepera*)

Pintail (*Anas acuta*)

Green-winged Teal (*Anas carolinensis*)

Blue-winged Teal (*Anas discors*)

American Widgeon (Baldpate) (*Mareca americana*)

Shoveler (*Spatula clypeata*)

Wood Duck (*Aix sponsa*)

Redhead (*Aythya americana*)

Ring-necked Duck (*Aythya collaris*)

Canvasback (*Aythya valisineria*)

Lesser Scaup (Bluebill) (*Aythya affinis*)

Bufflehead (*Bucephala albeola*)

Hooded Merganser (*Lophodytes cucullatus*)

Vultures and Hawks

Turkey Vulture (*Cathartes aura*)

Sharp-shinned Hawk (*Accipiter striatus*)

Cooper's Hawk (*Accipiter cooperii*)

Red-tailed Hawk (*Buteo jamaicensis*)

Red-shouldered Hawk (*Buteo lineatus*)

Broad-winged Hawk (*Buteo platypterus*)

Rough-legged Hawk (*Buteo lagopus*)

Marsh Hawk (*Circus cyaneus*)

Osprey (*Pandion haliaetus*)

Sparrow Hawk (*Falco sparverius*)

Gallinaceous Birds

Bobwhite (*Colinus virginianus*)

Ring-necked Pheasant (*Phasianus colchicus*)

Coots

American Coot (*Fulica americana*)

Shorebirds

Killdeer (*Charadrius vociferus*)

American Woodcock (*Philohela minor*)

Common Snipe (*Capella gallinago*)

Upland Plover (*Bartramia longicauda*)

Spotted Sandpiper (*Actitis macularia*)

Solitary Sandpiper (*Tringa solitaria*)

Pectoral Sandpiper (*Erolia melanotos*)

Least Sandpiper (*Erolia minutilla*)

Semipalmated Sandpiper (*Ereunetes pusillus*)

Gulls

Ring-billed Gull (Larus delawarensis)

Doves and Cuckoos

Rock Dove (Columba livia)
Mourning Dove (Zenaidura macroura)
Yellow-billed Cuckoo (Coccyzus americanus)
Black-billed Cuckoo (Coccyzus erythropthalmus)

Owls

Screech Owl (Otus asio)
Great Horned Owl (Bubo virginianus)
Barred Owl (Strix varia)

Goatsuckers to Kingfisher

Whip-poor-will (Caprimulgus vociferus)
Common Nighthawk (Chordeiles minor)
Chimney Swift (Chaetura pelagica)
Ruby-throated Hummingbird (Archilochus colubris)
Belted Kingfisher (Megaceryle alcyon)

Woodpeckers

Yellow-shafted Flicker (Colaptes auratus)
Pileated Woodpecker (Dryocopus pileatus)
Red-bellied Woodpecker (Centurus carolinus)
Red-headed Woodpecker (Melanerpes erythrocephalus)
Yellow-bellied Sapsucker (Sphyrapicus varius)
Hairy Woodpecker (Dendrocopos villosus)
Downy Woodpecker (Dendrocopos pubescens)

Flycatchers

Eastern Kingbird (Tyrannus tyrannus)
Great Crested Flycatcher (Myiarchus crinitus)
Eastern Phoebe (Sayornis phoebe)
Acadian Flycatcher (Empidonax virescens)
Traill's Flycatcher (Empidonax traillii)
Least Flycatcher (Empidonax minimus)
Eastern Wood Pewee (Contopus virens)
Olive-sided Flycatcher (Nuttallornis borealis)

Lark and Swallows

Horned Lark (Eremophila alpestris)
Tree Swallow (Iridoprocne bicolor)
Bank Swallow (Riparia riparia)
Rough-winged Swallow (Stelgidopteryx ruficollis)
Barn Swallow (Hirundo rustica)
Cliff Swallow (Petrochelidon pyrrhonota)
Purple Martin (Progne subis)

Jay and Crow

Blue Jay (Cyanocitta cristata)
Common Crow (Corvus brachyrhynchos)

Tree Gleaners

Black-capped Chickadee (Parus atricapillus)
Carolina Chickadee (Parus carolinensis)
Tufted Titmouse (Parus bicolor)
White-breasted Nuthatch (Sitta carolinensis)
Red-breasted Nuthatch (Sitta canadensis)
Brown Creeper (Certhia familiaris)

Wrens and Mimics

House Wren (*Troglodytes aedon*)

Winter Wren (*Troglodytes troglodytes*)

Carolina Wren (*Thryothorus ludovicianus*)

Mockingbird (*Mimus polyglottos*)

Catbird (*Dumetella carolinensis*)

Brown Thrasher (*Toxostoma rufum*)

Thrushes

Robin (*Turdus migratorius*)

Wood Thrush (*Hylocichla mustelina*)

Hermit Thrush (Hylocichla guttata)

Swainson's Thrush (*Hylocichla ustulata*)

Gray-cheeked Thrush (*Hylocichla minima*)

Veery (*Hylocichla fuscescens*)

Eastern Bluebird (*Sialia sialis*)

Gnatcatchers to Starling

Blue-gray Gnatcatcher (*Polioptila caerulea*)

Golden-crowned Kinglet (*Regulus satrapa*)

Ruby-crowned Kinglet (*Regulus calendula*)

Cedar Waxwing (*Bombycilla cedrorum*)

Starling (*Sturnus vulgaris*)

Vireos

White-eyed Vireo (*Vireo griseus*)

Yellow-throated Vireo (*Vireo flavifrons*)

Solitary Vireo (*Vireo solitarius*)

Red-eyed Vireo (*Vireo olivaceus*)

Philadelphia Vireo (Vireo philadelphicus)

Wood Warblers

Black-and-white Warbler (*Mniotilta varia*)

Worm-eating Warbler (*Helmitheros vermivorus*)

Golden-winged Warbler (*Vermivora chrysoptera*)

Blue-winged Warbler (*Vermivora pinus*)

Tennessee Warbler (*Vermivora peregrina*)

Orange-crowned Warbler (*Vermivora celata*)

Nashville Warbler (*Vermivora ruficapilla*)

Parula Warbler (*Parula americana*)

Yellow Warbler (*Dendroica petechia*)

Magnolia Warbler (*Dendroica magnolia*)

Cape May Warbler (*Dendroica tigrina*)

Black-throated Blue Warbler (*Dendroica caerulescens*)

Myrtle Warbler (*Dendroica coronata*)

Black-throated Green Warbler (*Dendroica virens*)

Cerulean Warbler (*Dendroica cerulea*)

Blackburnian Warbler (*Dendroica fusca*)

Yellow-throated Warbler (*Dendroica dominica*)

Chestnut-sided Warbler (*Dendroica pensylvanica*)

Bay-breasted Warbler (*Dendroica castanea*)

Blackpoll Warbler (*Dendroica striata*)

Pine Warbler (*Dendroica pinus*)

Prairie Warbler (*Dendroica discolor*)

Palm Warbler (*Dendroica palmarum*)

Ovenbird (*Seiurus aurocapillus*)

Northern Waterthrush (*Seiurus noveboracensis*)

Louisiana Waterthrush (*Seiurus motacilla*)

Kentucky Warbler (*Oporornis formosus*)
Mourning Warbler (*Oporornis philadelphia*)
Yellowthroat (*Geothlypis trichas*)
Yellow-breasted Chat (*Icteria virens*)
Hooded Warbler (*Wilsonia citrina*)
Wilson's Warbler (*Wilsonia pusilla*)
Canada Warbler (*Wilsonia canadensis*)
American Redstart (*Setophaga ruticilla*)

Weaver Finch

House Sparrow (*Passer domesticus*)

Blackbirds

Eastern Meadowlark (*Sturnella magna*)
Red-winged Blackbird (*Agelaius phoeniceus*)
Orchard Oriole (*Icterus spurius*)
Baltimore Oriole (*Icterus galbula*)
Rusty Blackbird (*Euphagus carolinus*)
Common Grackle (*Quiscalus quiscula*)
Brown-headed Cowbird (*Molothrus ater*)

Tanager

Scarlet Tanager (*Piranga olivacea*)

Grosbeaks, Finches, and Sparrows

Cardinal (*Richmondena cardinalis*)
Rose-breasted Grosbeak (*Pheucticus ludovicianus*)
Indigo Bunting (*Passerina cyanea*)
Evening Grosbeak (*Hesperiphona vespertina*)
Purple Finch (*Carpodacus purpureus*)
Pine Siskin (*Spinus pinus*)
American Goldfinch (*Spinus tristis*)
Rufous-sided Towhee (*Pipilo erythrophthalmus*)
Grasshopper Sparrow (*Ammodramus savannarum*)
Vesper Sparrow (*Pooecetes gramineus*)
Slate-colored Junco (*Junco hyemalis*)
Tree Sparrow (*Spizella arborea*)
Chipping Sparrow (*Spizella passerina*)
Field Sparrow (*Spizella pusilla*)
White-crowned Sparrow (*Zonotrichia leucophrys*)
White-throated Sparrow (*Zonotrichia albicollis*)
Fox Sparrow (*Passerella iliaca*)
Lincoln's Sparrow (*Melospiza lincolnii*)
Swamp Sparrow (*Melospiza georgiana*)
Song Sparrow (*Melospiza melodia*)
Bachman's Sparrow (*Aimophila aestivalis*)

part 5. Waterfowl at O'Shaughnessy Reservoir

Dabbling Ducks

- Mallard
- Black Duck
- Gadwall
- Pintail
- Green-winged Teal
- Blue-winged Teal
- Widgeon
- Shoveller
- Wood Duck

Diving Ducks

- Redhead
- Ring-necked Duck
- Canvasback
- Lesser Scaup
- Common Goldeneye
- Bufflehead
- Ruddy Duck
- Old-Squaw
- Hooded Merganser
- Common Merganser
- Red-breasted Merganser

Geese and Swans

- Canada Goose
- Blue Goose
- Whistling Swan

Rail Family

- Coot

Source: Burgess and Niple, August, 1974.

Part 6. Aquatic Organisms and Pollution

Aquatic organisms can be used as indicators of the quality of their environment. Such a method is based on the assumption that individuals and communities exhibit characteristic responses to particular environmental conditions. Generally, organisms can be divided into pollution-sensitive,pollution-tolerant, and facultative (adaptable to a wide range of conditions) types, depending on their tolerance to organic pollution.

Diversity of species and numbers of organisms within each species are also used as indicators. Generally, communities containing many species of similar abundance are characteristic of high quality environments, whereas communities containing few species, but great numbers of each species with unequally distributed abundance are often characteristic of poor quality environments. Communities of bottom-dwelling invertebrates, fish, and microscopic and macroscopic vegetation can all be used to identify the quality of the aquatic environment.

Freshwater invertebrates include a wide range of organisms, from simple unicelluar protozoa to macroinvertebrates such as mollusks and anthropods. Most of the larger invertebrates are benthic, or bottom-dwelling organisms, representing various stages of the life cycle. Those that are classified as pollution-sensitive invertebrates including gill-breathing organisms such as immature stoneflies (Plecoptera), mayflies (Ephemeroptera), alderflies (Megaloptera), and caddisflies (Trichoptera), all of which are insects. Pollution-tolerant forms include worms (Oligochaeta), certain midges of the family Chironomidae, leeches (Hirudinea), and pulmonate snails (Gastropoda).

Facultative forms that are able to adapt to wide range of conditions include immature beetles (Coleoptera), dragonflies (Zygoptera), dipterans including certain chironomids, blackflies (Simulidae), and craneflies (Tipulidae), gilled snails (Gastropoda) and fingernail clams (Pelecypoda).

FISHES OF ALUM CREEK
UPSTREAM OF WESTERVILLE, OHIO
DELAWARE COUNTY

	Common Name	Relative Abundance a/
1.	Least Brook Lamprey *b/	L b/
2.	Eastern Gizzard Shad	
3.	Central Redfin Pickerel a/	M
4.	Central Quillback Carpsucker	L
5.	Black Redhorse *	
6.	Golden Redhorse	M
7.	Hog Sucker *	M
8.	Common White Sucker	M
9.	Spotted Sucker a/	L
10.	Carp	
11.	Goldfish b/ (probable)	L b/
12.	Goldenshiner b/	L b/
13.	Northern Bigeye Chub	
14.	Western Blacknose Dace *	
15.	Northern Creek Chub *	M
16.	Southern Redbelly Dace * b/	L b/
17.	Silver Shiner *	L
18.	Rosyface Shiner *	
19.	Ohio Rosefin Shiner	M
20.	Striped Shiner *	H
21.	Spotfin Shiner *	L
22.	Northeastern Sand Shiner	M
23.	Northern Mimic Shiner	
24.	Silverjaw Minnow *	L
25.	Bluntnose Minnow	H
26.	Ohio Stoneroller Minnow*	H
27.	Yellow Bullhead a/	L
28.	Black Bullhead	L
29.	Stonecat Madtom *	L
30.	Brindled Madtom	L
31.	Fathead Minnow b/ (Blackstripe topminnow) a/	L a/ b/
32.	Troutperch	L
33.	Brook Silversides	
34.	White Crappie	L
35.	Black Crappie b/	L b/
36.	Northern Rockbass	L
37.	Northern Smallmouth Blackbass	M
38.	Largemouth Blackbass a/	M
39.	Green Sunfish	L
40.	Bluegill Sunfish a/	M
41.	Orangespotted Sunfish b/	H b/
42.	Central Longear Sunfish a/	L
43.	Pumpkinseed Sunfish a/	L
44.	Blackside Darter	L
45.	Ohio Logperch Darter	L
46.	Central Johnny Darter	M
47.	Greenside Darter *	L
48.	Eastern Banded Darter *	L
49.	Rainbow Darter *	M
50.	Barred Fantail Darter *	M
51.	Mottled Sculpin * a/ b/ (Central Redfin Sculpin)	L a/ b/

a/ Personal communication from personnel of the Ohio Department of Natural Resources, data obtained from surveys made in Delaware County, prior to 1971. L - Low, M - Medium, H - High.

b/ The list of fishes (Table IV) as it appeared in the Draft Environmental Statement was examined by Mr. Charles F. Willis after consultation with Dr. Ted M. Cavender, Curator of Fishes at the Ohio State University Museum of Zoology. Those fishes footnoted b/ were added to the original list after their examination. Those fishes marked with an asterisk (*) are in the opinion of Dr. Cavender and Mr. Willis "non-lake" species and will be extirpated from Alum Creek in the area of the flood pool.

Alum Creek prior to reservoir construction had a known naiad (freshwater mussel, bivalve, mollusk) fauna of 27 species. The U. S. Bureau of Sport Fisheries and Wildlife has advised that the naiad Simpsoniconcha ambigua presently occurs in a few widely scattered populations throughout its range. The naiad Villosa fabalis (Lea, 1831) occurs in Alum Creek and is believed to be one of two or three populations in Ohio. This species is found in firm sand-gravel substrates in flowing water. It was formerly widely distributed from the Great Lakes area south to Georgia and Alabama. In recent years Villosa fabalis has been found in isolated populations within this range.

Source: U.S. Army, 1972.

Appendix D

Population and Economic Projections

1. Introduction

Projections are simply current guesses about future conditions. Three major factors influence the probable accuracy of any such guess about the future. These factors are the assumptions made, the methodology used, and the quality of the current and historical data used. Assumptions are explicit statements which define which past, current, or probable future conditions influence a projection. A methodology is the procedure by which basic data and assumptions are combined to project future conditions. The quality of data is primarily determined by how current and detailed they are, as well as by how descriptive they are of the quantity being projected.

Three major types of projections are available for Delaware County, its townships, and the variously defined regions surrounding the City of Columbus. These projections are for land use, economic development, and population. The most important results are highly interdependent, since predicted changes in one category will directly influence changes in each of the other two categories.

2. Description of Projections

The name, source, and description of each evaluated projection are listed in the following tables. Each description contains a summary of the assumptions made, the methodology used, and the type of data base.

3. Evaluation of the Projections

There are a considerable number of relatively recent population, economic, and land use projections which could be useful in the prediction of future population in the proposed project area. Because each of these projections predicts different results, each projection needs to be evaluated to ascertain its probable accuracy. The procedure used in this evaluation eliminates those projections which are probably least accurate. First, each projection is analyzed in terms of the appropriateness of its methodology and the quality of its data base. Those projections which have inappropriate methodologies or are based on low quality data are eliminated. The remaining methodologies are then evaluated to determine how reasonable their basic assumptions are. The result of the entire evaluation procedure is to isolate and use the best projections to develop a reasonably accurate representation of the future.

Table E-1. Population Projections

Name and Source of Projection	Type of Projection	Area Coverage	Time Coverage	Major Assumptions	Major Data Inputs	Methodology
Population Estimates and Projections, Series P-25, No. [illegible], U.S. Bureau of the Census, May 1975.	Population	Counties, incorporated places, townships, and other governmental units	1970 actuals 1973 estimites	• Migration can be estimated accurately from changes of residence noted on individual income tax forms	• State vital statistics records • Individual income tax return data	• Projections are calculated from natural increases and migration
Population Projection, Columbus SMSA, Columbus Area Chamber of Commerce, Research Department, September 1974	Population	Delaware, Fairfield, Franklin, Madison, Pickaway Counties; City of Columbus	1970 actuals 1975, 1980, 1990, and 2000 projections	• Based strongly on a dynamic demographic model developed by Battele Columbus Laboratories	• Historic data	• Growth rates of export industries, fertility, and migration are each varied to arrive at 8 different projections
1972 OBERS Projections Volume 5, Series I, U.S. Water Resources Council, April 1974	Population	Columbus SMSA (Delaware, Franklin and Pickaway Counties)	1970, 1971 actuals 1980, 1985, 1990, 2000, 2020 projections	• Workers will migrate to areas of economic activity and away from areas of relatively slow growth or decline	• Predicted future changes in employment (to predict migration) • U.S. Census data from 1930, 1940, 1950, 1960, and 1970	• Projections are calculated from natural increases and migration
Population Projections, Delaware County Regional Planning Commission, July 1973	Population	Delaware County and each of its townships	1940, 1950, 1960, 1970 actuals 1980, 1990, 2000 projections	• Estimates of the establishment of some sewage in most portions of the project area by 1980	• Plans for development • Past trends • Buidling permits	• Judgmental decisions based on detailed personal knowledge of the area
Expanding the Regional Plan, Mid-Ohio Regional Planning Commission, June 1972	Population	Franklin County and adjacent townships (those in Delaware County are Concord, Liberty, Orange, Berkshire, Genoa, and Harlem Townships)	1960, 1970 actuals 1975, 1980, 1985, 1990 projections	• Townships surrounding and adjacent to Franklin County will be tied to its economic growth and thus to its population growth	• Employment projections • Historic trends	• No concise statement of methodology is made in Expanding the Regional Plan
Delaware County, Ohio Comprehensive Water and Sewer Development Plan, Finkbeiner, Pettis, and Strout, 1969	Population	Delaware County and each of its townships	1950, 1960 actuals 1965 estimates 1970, 1975, 1990, 1985, and 1990 projections	• The projection made is purposefully somewhat optimistic • Established communities, good highway access, a full range of utilities, and amenities are major attractors of population growth	• Building permit records • Historic population trends • Surveys of services, utilities, and amenities offered in each township	• The projections for Delaware County are derived by comparison of its population trends with regional and statewide trends • Projected population growth within townships is allocated from the total projected population of Delaware County on the basis of sources, utilities, and amenities.
The Columbus Area Economy, Structure and Growth, 1950 to 1985, Bureau of Business Research, the Ohio State University, early 1960's	Population • Population • Labor force	Franklin County	1950, 1960 actuals 1965, 1970, 1980, and 1985 projections	• Predicted change in the employment structure is the chief determinant of the future size and composition of population	• Past population trends • Projected economic growth	• Age, sex, and race distributions are projected as components • A number of independent projection techniques are used, including ones based on past population trends, projected economic growth, and projected labor force participation

Table E-2. Economic Projections

Name and Source of Projection	Type of Projection	Area Coverage	Time Coverage	Major Assumptions	Major Data Inputs	Methodology
Population Estimates and Projections; Series P-25, No. 580, U.S. Bureau of the Census, May 1975	Economic (as measured by per-capita income)	Counties, incorporated places, areas, townships and other governmental units	1969 actuals 1972 estimates	• Estimates are based on total money income	• 1970 Census income and related data • 1969 and 1972 federal income tax returns • State and county money income estimates prepared by the Bureau of Economic Analysis	• Is reflective of corrections to census data and changes in income, population, and geographic boundaries
Expanding the Regional Plan, Mid-Ohio Regional Planning Commission, June 1972	Economic (as measured by housing demand and distribution of employment by industrial type)	Franklin County and surrounding townships (those in Delaware County were Concord, Liberty, Orange, Berkshire, Genoa, and Harlem Townships)	Employment: 1960, 1970 actuals; 1980, 1990 projections Housing demand: 1970 to 1990 estimates Distribution of employment by industrial type: 1950, 1965 actuals; 1985 projections	• Increases in automation will slow the rate of employment increases in manufacturing industries • The economic base will diversify • Local industries will increase their proportional share of employment and economic growth • Basic non-commodity and local industries will continue to dominate the economic base	• Data and supporting projections from The Columbus Area Economy: Structure and Growth, 1950 to 1985	• The methodology is not sufficiently explained; although it appears to be based strongly on methodology developed in The Columbus Area Economy: Structure and Growth 1950 to 1985
The Columbus Area Economy, Structure and Growth, 1950 to 1985, The Ohio State University, Bureau of Business Research, early 1960's	Economic (as measured by employment, value added, income, trade, and housing)	Franklin County	1950, 1960 actuals 1965, 1970, 1975, 1980, and 1985 projections	• Change in employment structure is the chief determinant of the future size and composition of local population • Future (through 1985) net commuter inflow into Franklin County from adjacent counties will remain at the same proportion as that existing in 1960	• Historic trends • An input-output economic base study of Franklin County	• Use of historic trends • Use of a strong interrelationship of employment and economic projections to projections of trade, income, and housing
1972 OBERS Projections, Volume 5, Series E, U.S. Water Resources Council, April 1974	Economic (as measured by employment, personal income, and earnings by industry)	Columbus SMSA (Delaware, Franklin, and Pickaway Counties)	1970, 1971 actuals 1985, 1990, 2000, and 2020 projections	• Most factors which have in the past influenced shifts in regional "export" industry location will continue to do so in the future • Personal income and measures of employment are used as measures of the gross regional product	• Historic trends of numerous indicator variables • National and regional projections • In some cases, interviews with persons having local expert knowledge	• "Shift-share" technique used for basic (export) industries • Cobb-Douglas and Spillman type functions used for agricultural industries • Location quotients used for local service and residentiary industries

Table E-3. Land Use Projections

Name and Source of Projection	Type of Projection	Area Coverage	Time Coverage	Major Assumptions	Major Data Inputs	Methodology
The Mid-Ohio Region Housing Market Outlook 1970-1980, Mid-Ohio Regional Planning Commission, March 1971	Land Use • Housing	Franklin County and adjacent townships in other counties	1960, 1970 actuals 1980 projections	• Growth of employment opportunities determines in large part net increases in population • Growth of employment opportunities may be accurately estimated by using economic base study techniques	• Economic base data • Projected employment data • Household characteristics	• Employment is used to project population • Population and trends in household characteristics are used to project housing demand

Those economic projections which depend on an economic base methodology are prone to error. "The Economic Base of the Metropolis ", a detailed article by Hans Blemenfeld in the 1955 issue of the Journal of the American Institute of Planners (pg. 114-132) provides substantive criticism of the use of economic base studies as a projection tool. Because of this objection, economic projections in Expanding The Regional Plan and The Columbus Area Economy, Structure and Growth, 1950 to 1985 are each rejected. The 1972 OBERs Projections makes use of some economic base methodologies; however, substantial use of other methodologies as independent checks on accuracy helps maximize the probable accuracy of the projections. All the economic projections are based on accurate data. However, since The Columbus Area Economy, Structure and Growth, 1950 to 1985 was published in the early 1960's, its data inputs do not totally reflect recent trends.

Some population projections depend strongly upon future employment figures projected by economic base studies. Expanding the Regional Plan appears to do this, and economic base studies are definitely the basis of a number of population projections in The Columbus Area Economy, Structure and Growth, 1950 to 1985. Past population trends, however, are used as the basis of some population projections in The Columbus Area Economy, Structure and Growth, 1950 to 1985. These trends are based on pre-1970 data and do not totally reflect current conditions. The Delaware County Ohio Comprehensive Water and Sewer Development Plan has an excellent methodology, but is based on data which is not current. Population Projection, Columbus SMSA is based on current data, but the methodology is based partially on economic base study techniques. Because the accuracy of these economic base techniques is probably low, the population projections derived from them are also probably inaccurate.

There is only one actual land use projection examined that would provide information relevant to the project. This is The Mid-Ohio Region Housing Market Outlook 1970-1980. Other studies only provide information about current land use trends or present recommended concepts for the future distribution of land use. Information on factors affecting the geographic distribution of land use are used to develop projections of geographical patterns of area growth. The methodology for The Mid-Ohio Region Housing Market Outlook 1970- 1980 uses population projections as a major base in the prediction of housing variables. However, these population projections are based primarily on an economic base study. Since there is considerable doubt as to the validity of projecting population on that type of study, doubt must be cast on the probable accuracy of the predicted housing variables.

An anlysis of the methodology and data inputs of the available projections serves to reduce a large number of projections to a small number. The basis for the evaluative criterion of the accuracy of this small number of screened projections is provided by the explicit assumption on which each projective technique is based.

Three population projections need further evaluation. One, Population Estimates and Projections, does not predict future populations. Instead, it estimates population change between April 1, 1970 actuals,as determined by the Census of Population, and July 1, 1973 estimates. A primary assumption is that the migration component of population change in an area can be accurately determined from changes in residence noted on individual income tax forms. This assumption seems reasonable. Its accuracy depends on the accurate projections of the conditions which lead to migration. The 1973 estimates form the most highly accurate documented estimates of recent population changes. Caution should be used, though, in interpreting these estimates. The Columbus Area Chamber of Commerce believes that certain local economic indicators point to somewhat more population growth than is indicated by the July 1, 1973 estimates (Thomas, private communication, 1975). The 1972 OBERS Projections assumes that population migrates to areas of economic activity and away from areas of less economic activity. This assumption is reasonable; therefore, the 1972 OBERS Projections probably forms the most accurate of existing projections of regional (Delaware, Franklin, and Pickaway Counties) population change. Population Projections was developed by the Delaware County Regional Planning Commission. It assumes establishment of central sewage in the project area by 1978 and is based on detailed, current, and ongoing knowledge of development in Delaware County. This knowledge of local development maximizes the probable accuracy of the population projections for Delaware County and each of its townships. However, it should be noted that long-term projections for small populations, such as those in each township, are highly prone to error. This error is lowered by grouping the townships into an approximation of the total project area.

Two economic projections need further evaluation. Population Estimates and Projections estimates per capita income as of July 1, 1974. It is based on the accuracy of federal income tax returns, so its estimates of income are reasonable. The 1972 OBERS Projections is based on factors which have influenced past regional economic projections.

The one land use projection was discarded because it uses an economic base study as a primary tool for projecting housing demand. The discussion of geographic trends should, however, shed some light on the amounts of probable future growth of different types of land use.

APPENDIX E
ALTERNATIVES - DETAILED ANALYSIS

1. Franklin County - I-270

a. Engineering Analysis

Construction of the proposed facility at site OR-1 would require three major modifications of the basic system: extension of the large interceptor which collects from the three basins, a pumping station, and a relatively lengthy outfall line.

Approximately 2 1/2 additional miles of 42 inch interceptor line through Franklin County would be necessary to reach site OR-1. This could be most easily laid near Ohio 315 south to the I-220 interchange. Here it could utilize the river underpass before running inland to the site.

Sewage would be regulated by the wet wells of a pumping station located 3/4 mile south of the interchange and to the east of Highway #315 and relayed to the site by a 16" force main for one mile. The pumping station would have a system lift of approximately 130 feet and design peak flow of no less than 9 mgd. Two minor highway ramp crossings for the 42" sewer line and a highway crossing for the 16" force main would be required.

The outfall location here is of prime importance since the major reasons for suggesting this site were to minimize biological impacts. The outfall should be located downstream of the areas of good aquatic habitat. This consideration would place the outfall location about a half mile north of Ohio 161 and immediately downstream of the riffle area. A 1-1/2 mile outfall pipe would be required in order to meet this demand. To avoid major highway crossing and damage to forested areas, the outfall pipe would run southwestward for approximately half mile, hence along Snouffer Road eastward, swing southward at Highway #315, and cross this highway where the divided section ends.

b. Land Use Analysis

Land use in the immediate vicinity is a mixture of speculative, residential and agricultural. Major transportation arteries are already in existence to the north and east of the site. Nearby land includes forested and recreational areas utilized by fishermen. These and other unintensive uses are being diminished by the continued expansion of metropolitan Columbus. Construction and operation of both the plant and its sewer system could have impact on area land uses.

The plant would have small impact at the site which is presently composed of small trees, undergrowth and some agricultural fields. There are no commercial or industrial areas near by and only light residential development at present. Secondary effects might include limitation of the residential and commercial development that usually occurs near major highway interchanges. Some local depression in land values might also be expected.

The sewer and outfall lines would cause only temporary disruption of surrounding land during construction. Recreation and fishing should return to normal upon projection completion since the pumping station and lines are to be underground and the outfall would be located below the major fishing area. Secondary effects of sewer construction might be to stimulate some growth north of the plant if the Worthington Hills and Mount Air areas were to be serviced.

c. Environmental Effects

Visual impact is extremely variable due to possible differences in plant design. If the present mitigative architecture were used, this impact would not be a significant factor. The plant would be clearly visible from the outerbelt.

Odor and noise would be much more adverse in this residential area than in other more rural sites. Prevailing winds would carry odors northeast towards Mount Air or east over other outlying suburbs of Columbus. The noise and odor reduction characteristics in the plant design would be very carefully considered here to satisfy nearby residents. The extra pumping station required might also contribute a certain amount of noise but this would probably be covered by the normal highway noise at the interchange.

Water quality degradation is determined by both the effluent concentration and the instream flow. Since the effluent concentration is assumed to be the same at all sites and the instream flow varies to only a minor extent, water-quality effects will be nearly equal for all sites on the Olentangy.

Under most probable conditions, the impacts of the project on the river water quality are expected to be insignificant for DO, BOD_5, NH_3, and NO_3, and TDS.

d. Biological Impacts

The major strong point in favor of sites OR-1 and OR-2 is that they are better suited to reducing impacts on the natural environment than sites in Delaware County. This particularly concerns the aquatic environment in the Olentangy River. There would also be no destruction of established forest areas necessary at these sites.

The Olentangy River in Franklin County has not been designated as scenic beyond Wilson Bridge Road and much of the river species habitat has been reduced or destroyed by channelization. The populations of both living and dead collected mollusk specimens are low immediately north of the artificial fish habitat area 3 miles south of Powell Road.

As has been reported by Griswold (letter, AppendixJ), populations of desirable fish reach a distinct peak north of the artificial habitat area and drop abruptly south of the area toward Henderson Road. Benthic organisms which are the fish's main food supply are numerous and have a large diversity and abundance north of the site at Powell Road (Olive and Smith 1975). The outfall from the site should be placed south of the I-270 interchange about 1/2 mile north of Ohio 61 in order to avoid the desirable fishing area near the interchange. Because of the relative scarcity of large organisms downstream from the outfall, the placement of the plant and outfall at site OR-1 would have relatively few noticeable biological effects on the river.

The large influx of nutrients from the effluent would result in an increase in algae and bacterial growth. The growth, however, is largely independent of location, depending instead on the dilution of the effluent by the stream. As the most southerly site, the greatest flow and hence the largest dilution factor occurs at this point due to additions from upstream tributaries. Water quality deterioration would be reduced slightly for these same reasons.

Three rare and endangered species of naiades (mollusks) and one fish species have been found in past years near the site, as reported in Chapter 2. The presence of these rare and endangered species is an important consideration in treatment plant placement; however, due to their low numbers, their range and present existence in the river is poorly defined.

e. Institutional Considerations

Delaware County, as a County Sewer District under Section 6117 of the Ohio Revised Code, cannot condemn land in another county for the construction of a wastewater treatment facility. However, Section 6117.41 of the Ohio Revised Code does enable a county to contract with another political entity for the joint construction and usage of sewers and wastewater treatment facilities. Therefore, the proposed facility can be constructed at site OR-1 within Columbus if it serves some area of Columbus and perhaps Mt. Air and Worthington Hills within Franklin County along with servicing Delaware County and if Delaware County and Columbus agree to the necessary contract. It should be noted that the northern areas of Columbus along the Olentangy River are not yet being serviced by metropolitan sewers, but there are some local sewer systems.

There are political obstacles, however, to the signing of such a contract between Delaware County and Columbus. Delaware County feels its autonomy threatened by the rapidly growing Columbus metropolitan area while Columbus, cognizant of Delaware County's attitude and concentrating on developing its own Facilities Plan and expanding services within Franklin County is not currently anxious to cooperate.

2. Powell Road - Olentangy

a. Engineering Analysis

As this is the site designed in the Facilities Plan, the interceptor lines required are those outlined in Figure 3-1. The site eliminates the necessity for any pumping stations within the Olentangy Basin due to its low elevation. All indications are that subsurface conditions would not pose any particular construction problems at the site.

b. Land Use Analysis

Site OR-3 is currently devoted to agriculture. It also serves as a small part of a scenic vista from portions of the Highbanks Metropolitan Park. Park authorities have expressed considerable concern about impacts to recreational use in adjacent parkland. It is possible that there would be slight impacts on park users but the effect would not be severe enough to change the land use of the park. Chapter 5 discusses these points in detail.

Across Route 315 from the site, land is occupied by scattered residences and a farm. There is also a subdivision several thousand feet to the west-northwest. Significant residential development could potentially occur in this and other nearby areas.

A plant located here might limit future public access to the river in this area. This access along the Olentangy River is considered important by the Ohio Department of Natural Resources in its _Statewide Plan for Outdoor Recreation in Ohio 1971-1977_ (1970). Construction of the sewers would also cause changes in land use, such as differences in growth rates and types of development. The exact location of the outfall could cause land use changes by affecting downstream recreation. Maintaining water quality for recreational purposes is viewed as extremely important by the Columbus Department of Recreation and Parks and is an integral component of the Watercourse Plan for Columbus and Franklin County (1974).

c. Environmental Effects

Visual impact of the plant at this site is expected to be minimal due to the extensively designed beautification program in the Facilities Plan and natural riverside vegetation.

Odor problems from the plant are planned to be throughly controlled.

Noise problems should not be significant here. Noise levels at the park should be far below the decibel levels recommended by HUD for recreational areas due to distance and control measures.

Water quality in this section of the Olentangy has been degraded both historically and presently due to upstream sewage treatment facilities, sewage discharges from leaking septic tanks and some nutrient runoff from surrounding farmland. The plant would eventually help reduce the amounts of coliform bacteria through treatment and disinfection. Levels of other substances will be within the Olentangy waste load allocation.

Environmental effects are discussed in greater detail in Chapter 5.

d. Biological Impacts

The major impacts upon aquatic life that might occur involve effects on populations of mollusks, fish, and benthic organisms.

Changes in the populations of mollusks, fish, and benthos could result from various chemical compositions of the effluent. The main effects are due to oxygen depletion and toxic substances.

Adverse impacts on or the elimination of rare and endangered species could occur with respect to the four mollusks and the one fish. These species have been discussed in Chapter 2.

e. Institutional Considerations

A mitigative measure for site OR-3 is the placement of an outfall along the sides and median strip of State Route 315 in Delaware and Franklin Counties, past the interchange of State Route 315 and Interstate 270 in Columbus. This is developed in Section F of Chapter 3.

3. Powell Road - Powell

a. Engineering Analysis

Construction of the proposed facility at Site OR-7 would require a lift station located immediately south of Powell Road and on the east bank of the Olentangy River. A 16-inch force main 3000 feet in length would be required to deliver the sewage from the Olentangy and Alum Creek Basins to the site. The lift station would have a peak capacity of 6 MGD and a total system head of 200 feet. One river crossing and one highway crossing would be required for the force main and would run along Powell Road east to the river. The force main and interceptor system carrying sewage from the Scioto Basin would need to be re-routed; however, no significant change in length of line would be required.

The extent of outfall work depends on the selected outfall location. Two possible locations are proposed. One is located immediately south of Powell Road, and the other approximately 1-1/8 river miles south of Powell Road at the county line. The two would require 3,000 and 10,000 feet of outfall pipe, respectively. Both would need to cross Ohio 315 once. The general route would be east along Powell Road, crossing Ohio 315 at the intersection and then following Ohio 315 south-south easterly for about a mile. This route has been shown in Figure 3-8. The route would then turn east toward the river near the county line. In the entire biologically active scenic river segment, additional outfall piping would be necessary. The incremental piping requirements would be the same as those of Site OR-3.

The site is on flat terrain and there is no indication of near surface bedrock which would increase construction problems. Some grading work accompanied by rapid planting of ground cover might be required on the southern end of the site to reduce erosion into Bartholomew Run area.

b. Land Use Analysis

Site OR-7 is currently open fields, possibly used for grazing animals with some adjacent cropland. Forest area adjoins the site on the south and partially surrounds it to the west. None of this forested area is suitable for developmental use due to the steep gradient. A small pond exists on the western edge of the site and a road defines the eastern border. There are several residences within 1/2 mile of the site. The plant would be far enough away from the Highbanks Park to ensure lack of impact.

Primary land use impact from the plant would be slight aesthetic impact on drivers on Powell Road and possible changes in the casual recreational use of the Bartholomew Run area. Future impacts would be necessary changes produced in the planning concept of the Village of Powell. Currently, plans for the first development stages are centered around Site OR-7.

All sewer and outfall lines would be run along road rights-of-way and so would have minimal impact on existing land use except during construction. Secondary impacts, however, involving recreational water use below the outfall would be similar to those for OR-3.

c. Environmental Effects

Impact of the proposed plant on visual aesthetics is insignificant. Although the plant will be visible from Powell Road, trees planted on the northern perimeter would eliminate this impact. No additional expense or effort would be necessary to accomplish this, since the basic plan already includes significant tree and shrub plantings.

The prevailing wind flow would remain similar to the regional pattern from the southwest. The development within a one mile radius of the site is presently quite sparse so that odor and noise problems would not be significant on residential receptors. There could be odor impacts on Powell Road, but these are planned to be controlled.

Water quality impacts would be identical with previously described sites. The amount of impact on biological organisms would be dependent on which of the possible outfall locations were chosen.

d. Biological Impacts

Aquatic impacts all relate to the outfall location of the plant at this site. There are three possible locations:

- on the Olentangy directly east of the plant
- south of the plant site on the Olentangy at the Franklin-Delaware County line
- on the Olentangy in Franklin County south of the artificial riffle-pool area.

Placement on the discharge on the river east of the site would affect the naiad population in this area of the river. The largest number of living naiades was found in this area near Powell Road by Dr. Carol Stein (1975). Thus the possibility of adverse impacts to this population would be increased by placing the outfall in this location. In addition, the previously discussed fish population, considered by the U.S. Fish and Wildlife Service to be abundant and diverse in this area, would also be impacted by the chlorine and ammonia discharges from the plant at this location. The even more abundant fish populations at I-270 intersection would also be affected, since the chlorine and ammonia concentrations in the discharge would not be adequately reduced in the river. Use of the discharge at the Delaware-Franklin County line has been previously discussed for Site OR-3.

The site is not forested, thus no tree clearing would be necessary to construct the plant at this site. This site is close to Bartholomew Run, which is an area that contains a mixture of upland vegetation in the higher areas and some lowland and river bottom vegetation in sloping and lower areas. The characteristic upland vegetation is comprised of such species as beech, red and sugar maple, red oaks, white oaks, and ash. The lowland river bottom vegetation is characterized by sycamore, cottonwood, box elder, maples, yellow poplar, and oaks. Some of these areas would have to be crossed in order to place the plant's outfall at either the county line or in Franklin County below the fish habitat area.

Rare and endangered species that may be impacted are the aquatic naiad and fish species mentioned previously.

e. Institutional Considerations

The only course of action here which would involve institutional considerations is the placement of an outfall in Franklin County below I-270.

4. Alum Creek

a. Engineering Analysis

The construction of the proposed facilities at the site AC-1 would require some modification of the interceptor trunk, force main and pumping facilities between the Olentangy River Basin and the Alum Creek Basin as illustrated in the base layout of the interceptor network, Figure 3-1.

The modification would require a lift station located south of Powell Road at the Olentangy River to deliver the sewage from both the Scioto River Basin and the Olentangy River Basin via a 20-inch force main eastward along the Powell Road beyond the ridge line approximately 500 feet east of the Norfolk and Western Railroad. From the ridge line, the sewage would be conveyed to the plant by a gravity flow interceptor 42 inches inches in diameter. The 42 inch interceptor would take the route along the north side of the Powell Road eastward, pass the Worthington-Galena Road where Powell Road terminates, extend southeastwardly down the valley, cross the Alum Creek via a river crossing, and reach the plant from the east. The modified interceptor would require the addition of:

- 13,000 feet of 42-inch diameter gravity flow interceptor line
- 16,000 feet of 20-inch diameter force main
- one lift station with peak capacity of 7 mgd and system head of 330 feet

However, the following items could be eliminated from the basic plan:

- 11,000 feet of 27-inch diameter gravity flow interceptor line

- 13,000 feet of 18-inch diameter force main
- lift station with peak capacity of 2.3 MGD and system head of 205 feet

The incremental cost for this modification excluding pumping facilities is approximately $410,000. Adoption of this alternative site would considerably increase the construction and operation costs of the lift station due to larger capacity and higher lift than the base system.

Three outfall locations are possible. One would discharge into the river directly west of the site. Required pipe length for this would be 1000 feet. The route has been indicated in Figure 3-10. The other outfall location would be at the Delaware-Franklin county line. The rationale for this is that it would be possible for the City of Westerville to relocate their drinking water intake north of this location in Delaware County, with the County's permission. Line length for this choice would be about 0.9 miles. The third location would be in the City of Westerville. However, Westerville would have to agree to lease the needed land to Delaware County.

The plant site is in a flat area with no forested areas. The soils are silt loams with no limestone or bedrock in the top five feet. Grading site preparation, and construction would be simple and inexpensive at this site.

b. Land Use Analysis

Presently site AC-1 is used as an undeveloped open field. The immediate vicinity includes residential, transportation and recreational uses. Residences near the site are of low density except 1/2 mile to the northeast where there is considerable development near the Westerville Reservoir. Recreational use is also primarily in this sector near the reservoir. The Alum Creek Reservoir is over two miles north and would not be significantly affected.

Primary plant impacts would be minimal. Possible slight impacts are odor impacts on nearby residences and recreation acres to the northeast. The land on the site would probably become residential in the near future, and plant construction would limit this use.

Construction of sewer and outfall lines for site AC-1 would be similar in land use impacts to sites on the Olentangy River. Although the interceptor system requires additions and deletions for this site, most of these changes in are in line sizing rather than routing. As with the Olentangy sites, some temporary impact on stream recreation use would be expected downstream from the outfall.

c. Environmental Effects

Environmental effects at this site include the aesthetic impacts of visibility, odor and noise. In addition, however, this site would be discharging water originally taken from the Olentangy River by Del-Co water into Alum Creek and would not rejoin its original water course until many miles downstream at the confluence with the Scioto. Water quality impacts from from the water diversion and from the discharge are compared below with those expected to occur on the Olentangy.

The site would be quite visible from all directions although following the presently proposed mitigative architecture for the plant would help minimize visual impact.

The development on the north and northeast sectors approximately 1500 feet and further from the site may receive some odor problems, because they are situated in the path of the local prevailing winds, but odor control is planned. Noise problems would be minimal since the plant could be located nearly 1/2 mile from the nearest residence.

The initial 1.5 MGD and projected 3.0 MGD sewage flows would all originate from the Olentangy River due to the Del-Co water supply which services all three basins. This would imply a deficit of about 3.0 MGD in the segment of the Olentangy River south to the confluence of the Scioto River and Big Walnut Creek, of which Alum Creek is a branch. This water would be added to the normal flow of Alum Creek.

The exact effects of this withdrawal and diversion are complicated by such factors as the schedule of withdrawal by Del-Co water, use of holding and storage tanks by Del-Co water use of hold and storage tanks by Del-Co water and the recent construction of the Alum Creek Dam. Under the most probable circumstances, however, the water diverted across basins would be approximately 9 per cent of the median flow (66.6 MGD or 103.0 cfs) in the Olentangy River. This small amount would have, at worst, minor adverse effects on the water quality in the Olentangy. Lowflow effects would be more sever, however.

The water quality impact during the most severe conditions would be similar to those discussed for sites OR-1, OR-3, and OR-7. This could pose a significant problem to the Westerville water supply if mitigative of ameliorative procedures discussed above are not taken. Expected impacts on the water supply would include problems from ammonia, nitrates, and total dissolved solids.

6. Biological Impacts

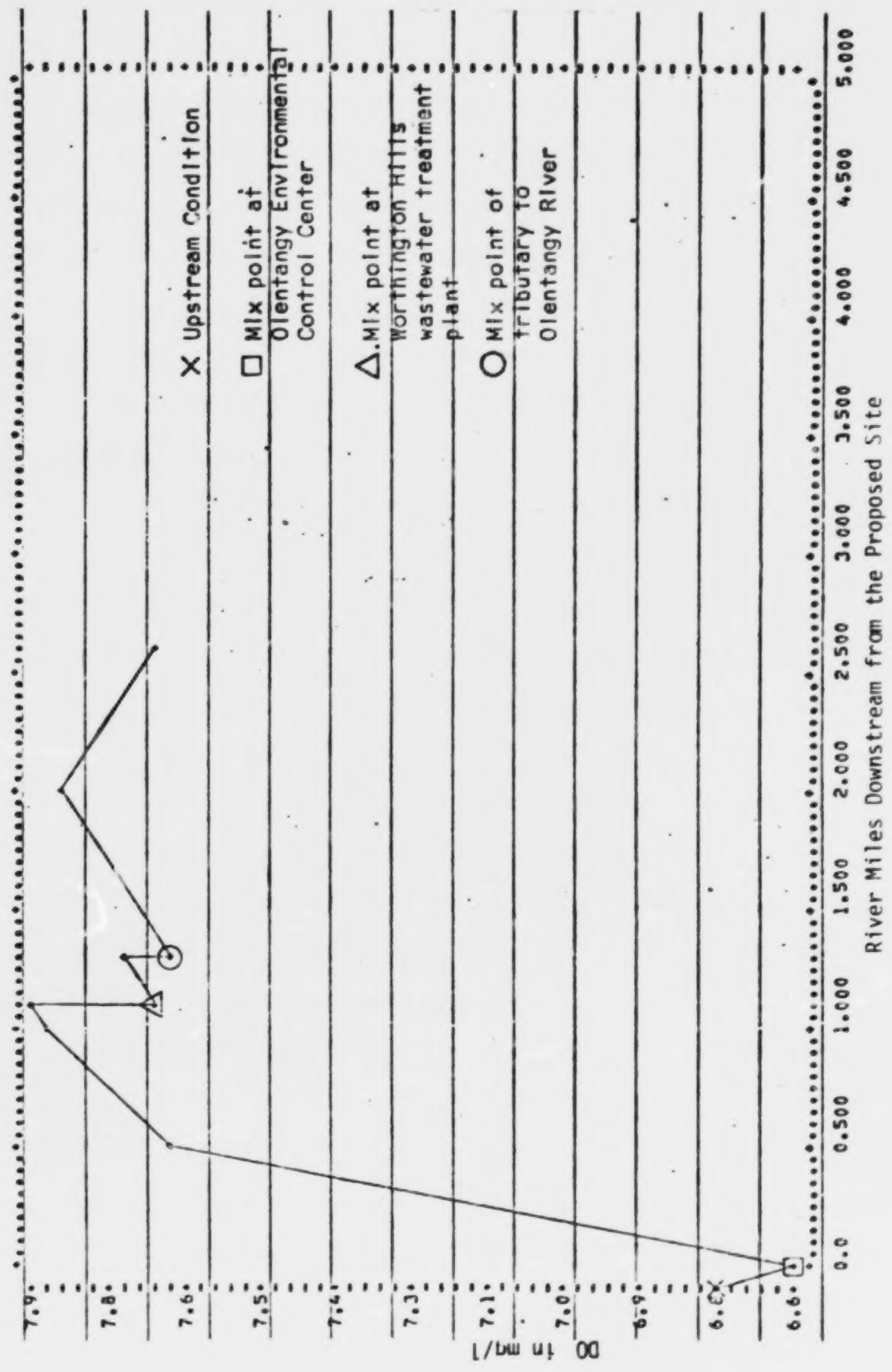
Alum Creek has been described by U.S. Bureau of Sport Fisheries and Wildlife (Corps of Engineers, 1973) as a small mouth bass stream. The effects of the dam construction and operation upon the aquatic biota in the portions of the creek below the dam need to be investigated to accurately determine the presence or absence of the benthos and fish populations that were previously there, including endangered mollusk species. Only when this investigation is completed can a rational decision to use this site as an alternative be made.

No significant terrestrial habitat would be destroyed by the use of this site. Scrub plant species would be removed and small animals inhabiting the open field would relocate in nearby areas.

e. Institutional Considerations

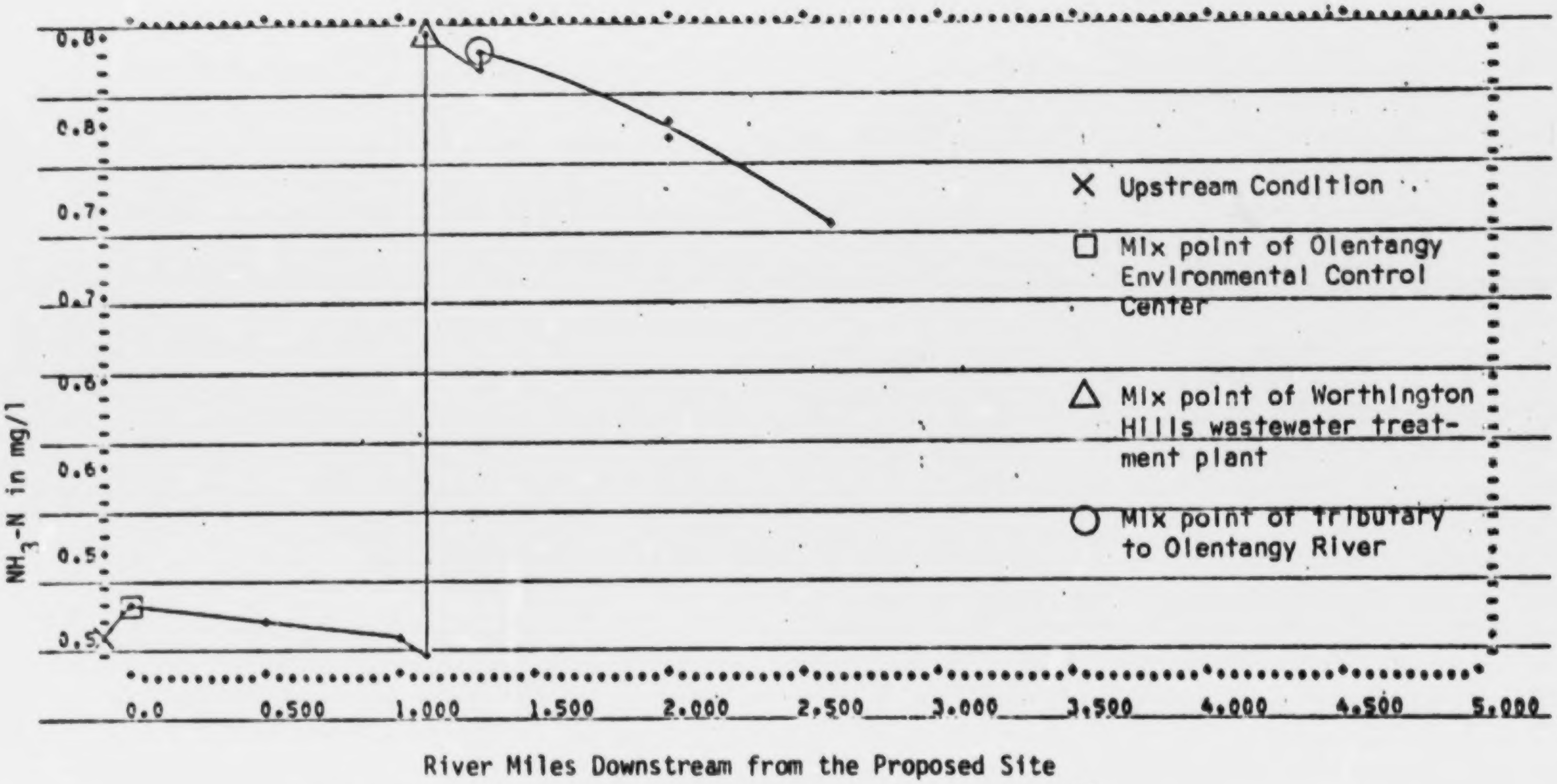
The placement of the proposed plant on Alum Creek with an outfall in Westerville below the Westerville water intake would cause institutional and legal problems. Since Westerville is located within Franklin County, Delaware County cannot condemn easements within that municipality. Delaware County can place an outfall within another county if they receive a permit to use state-owned rights-of-way. However, there are no state highways close enough to Alum Creek to make this action practical. However, Delaware County can place the outfall in Westerville, if Westerville agrees to lease the land to Delaware.

Institutional problems may be minimized if the outfall is located in Delaware County. However, this would require the relocation of Westerville's water intake, north of the Delaware-Franklin County line.



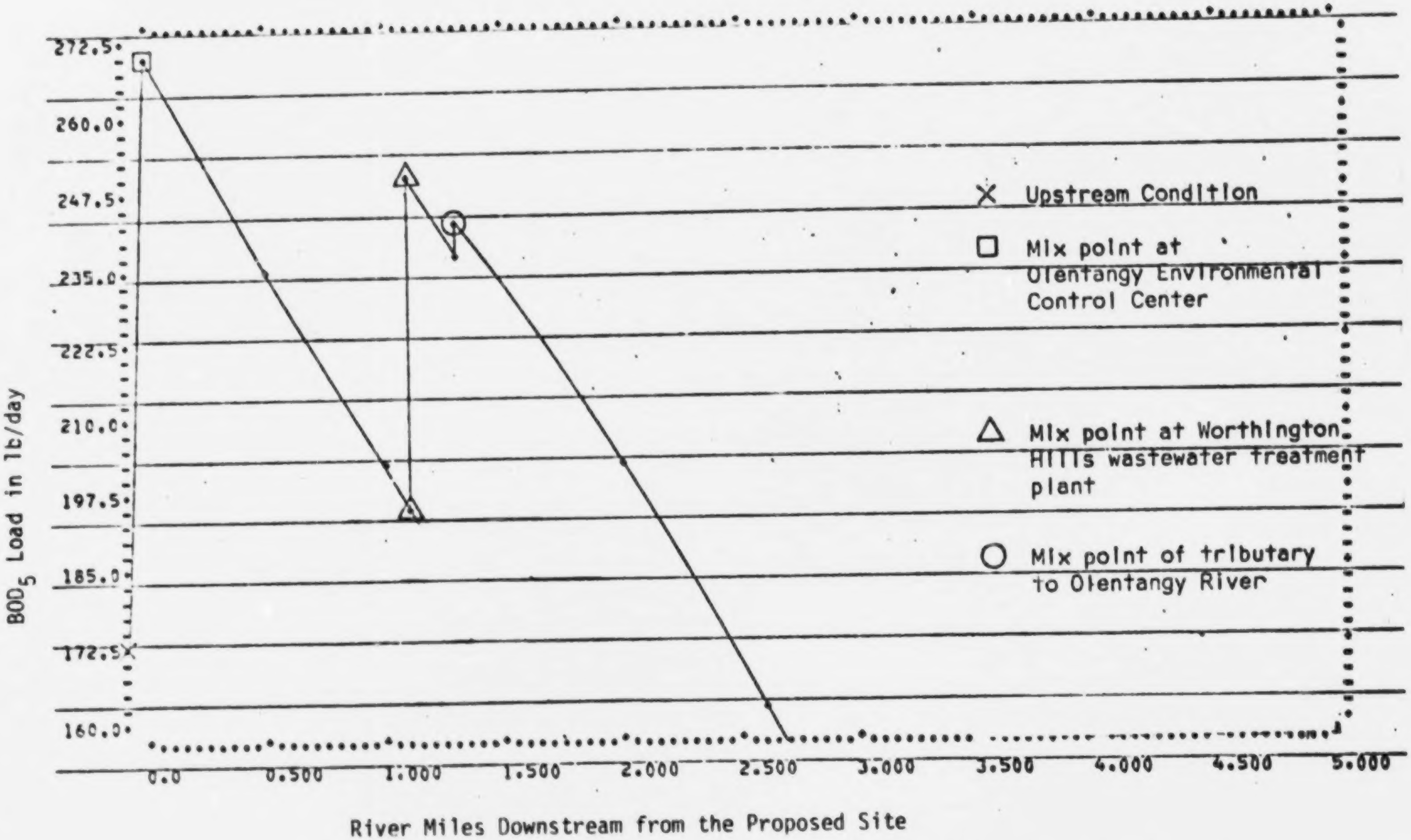
1. Profile of projected Dissolved Oxygen (DO) level.

Source: Burgess & Niple, Ltd., 1974



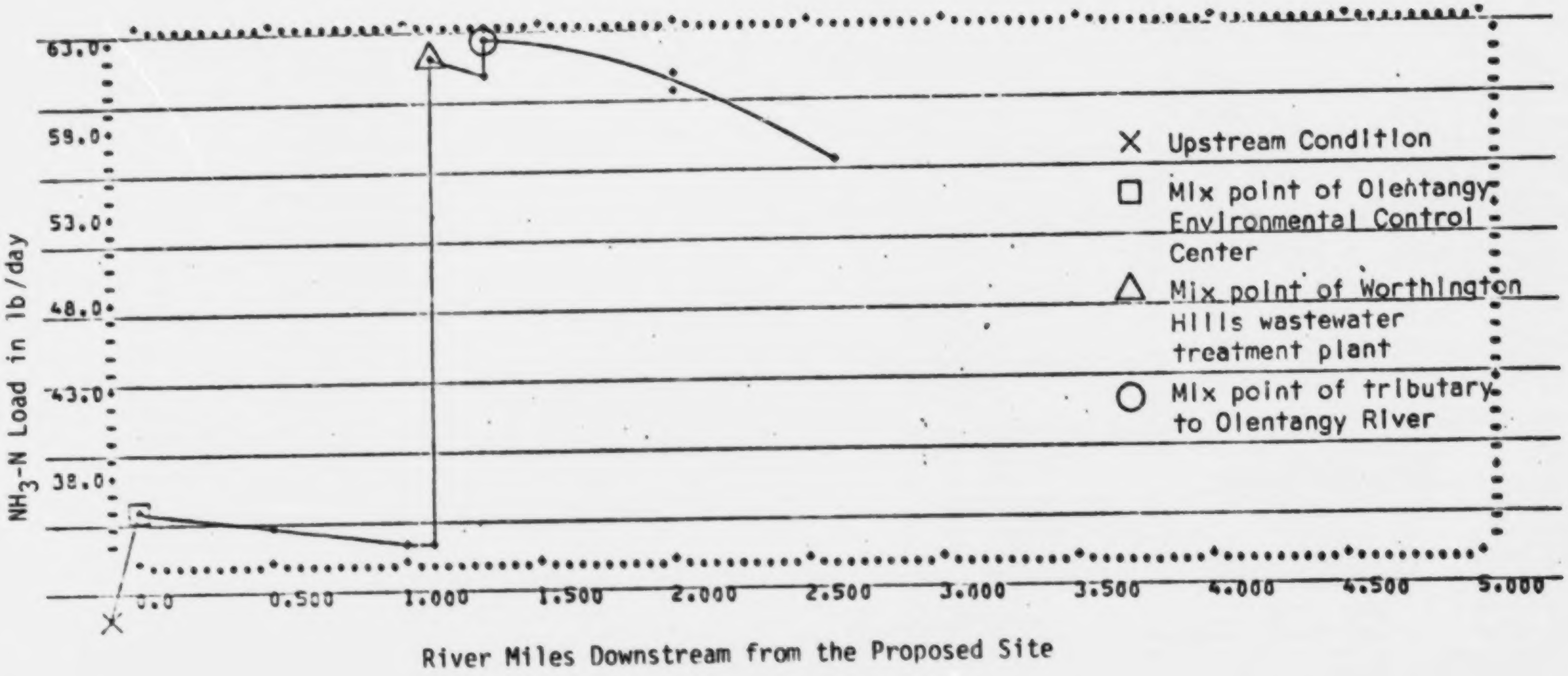
2. Profile of Projected Ammonia Level as Nitrogen (NH_3-N).

Source: Burgess & Niple, Ltd., 1974



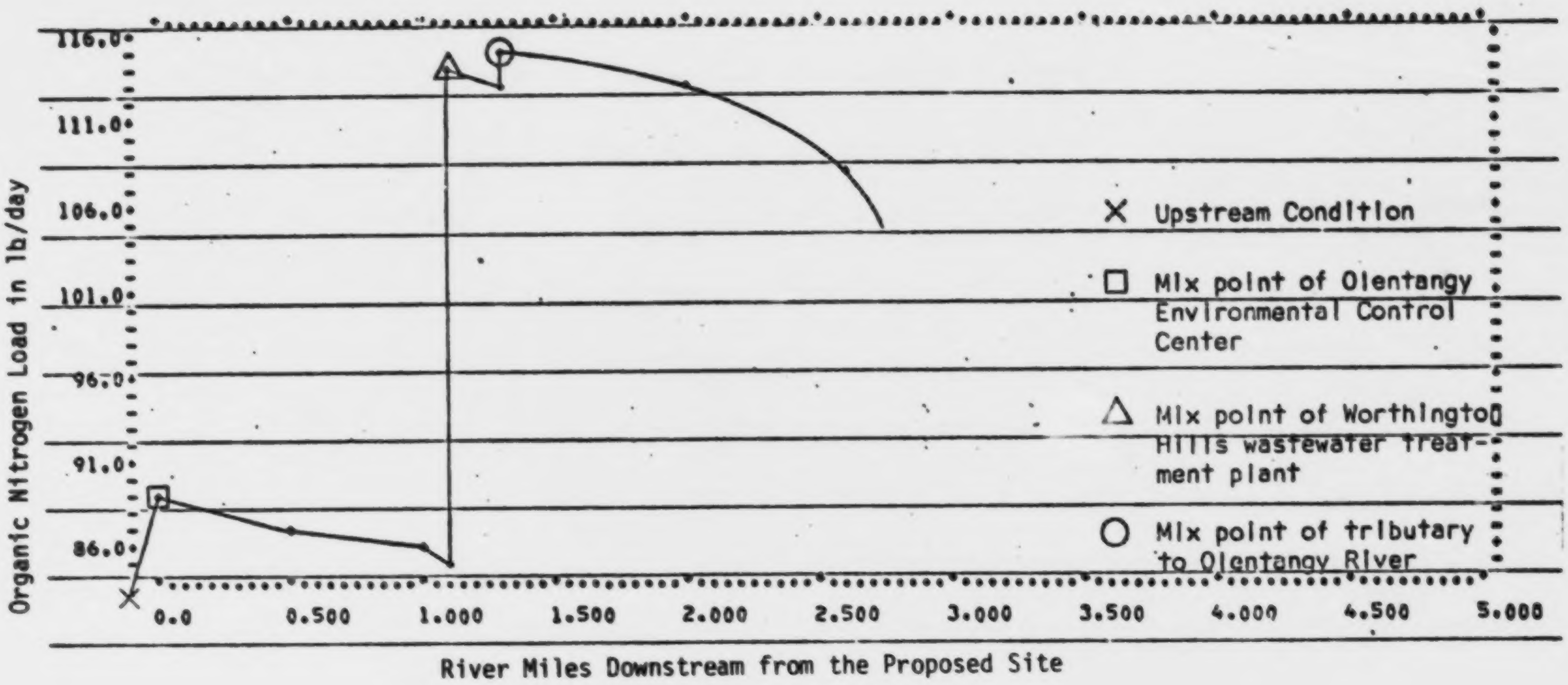
3. Profile of Projected Flowing Load of 5-day Biological Oxygen Demand (BOD_5)

Source: Burgess & Niple, Ltd., 1974



4. Profile of Projected Flowing Load of Ammonia as Nitrogen (NH_3-N)

Source: Burgess & Niple, Ltd., 1974



5. Profile of Projected Flowing Load of Organic Nitrogen.

Source: Burgess & Niple, Ltd., 1974

COST-EFFECTIVENESS SUMMARY
SLUDGE HANDLING FACILITIES
Delaware, Ohio

Alternate Plan	Initial Cost	Salvage Value	0 to 5 Years Constant Annual O & M Cost	0 to 5 Years Variable O & M Cost	6 to 20 Years Constant Annual O & M Cost	6 to 20 Years Variable O & M Cost	Present Worth	Avg. Annual Equiv. Cost
A. Aerobic Digestion-Land Application (Liquid)	$ 536,300	$137,300	$11,900	$6,600	$18,500	$23,400	$ 810,000	$ 76,500
B. Aerobic Digestion-Land Application (Dewatered)	539,600	138,000	13,100	7,400	20,500	28,800	856,300	80,800
C. Aerobic Digestion-Sanitary Landfill (Dewatered)	493,600	126,200	11,400	7,600	19,000	30,100	797,630	75,300
D. Incineration-Sanitary Landfill (Ash)	1,293,800	234,800	17,600	7,100	24,700	19,400	1,608,900	151,900
E. Heat Treatment-Sanitary Landfill	1,289,700	234,100	16,700	5,700	22,400	20,600	1,582,300	149,400

APPENDIX H
CHLORINE AND AMMONIA IMPACTS

1. Chlorine and Ammonia Impacts

a. Aquatic Impacts

Research by the USEPA is presently underway at a sewage treatment plant in Grandville, Michigan, which treats only domestic sewage and contains no industrial inputs. Most of the species of fish used for the experiments are the same species present in the Olentangy River; thus, similar conclusions can be drawn concerning the effects of the proposed plant's discharges to the results of the experiments. Table H-1 presents the information obtained from the research group at the treatment plant in Michigan. This table shows that the species most sensitive to chlorine are such forage fish as the shiners and minnows. These fish are large portions of the diet of the larger and more desirable game fish, such as the bass and sunfish. Additional information on chlorine effects is supplied by Table H-2.

Tsai (1971) studied the diversity of fish, in three states, in streams which maintained a residual chlorine concentration of 0.5 to 2.0 mg/l below sewage outfalls. He typically found a clean bottom without living organisms in the immediate area below these discharge locations. He found that the stream bottoms near unchlorinated outfalls were usually covered by large growths of wastewater fungi. The fish species diversity showed a 50 percent reduction when the chlorine concentration

Table H-1 Acute 96-Hour TL-50* of Various Fish Species

Species		Chlorine Concentration in ppm
Golden Shiner		0.040
Pugnose Shiner		0.045
Northern Common Shiner		0.051
Fathead Minnows	test 1)	0.095
	test 2)	0.082
Crappie		0.127
Bluegills	test 1)	0.278
	test 2)	0.195
Largemouth Bass		0.241

* Median tolerance level (50 percent survival)

Source: DeGrave, 1975

Table H-2 Toxic Effects of Residual Chlorine on Aquatic Life

Species	Effect Endpoint	Chlorine Concentration in ppm	Reference
Fathead Minnow	Safe concentration	0.0165	Arthur & Eaton, 1971
	Total kill - 96 hr.	0.16-0.21	Zillich, 1972
	Partial kill - 96 hr.	0.07-0.19	
	Sublethal stress	0.04-0.09	
	Threshold concen.	0.04-0.05	
	96-hour TL-50*	0.05-0.16	Zillich, 1969
	7-day TL-50	0.082-0.115	Arthur, 1971
	All killed in 3 days	0.154	Arthur & Eaton, 1971
Black Bullhead	96-hour TL-50	0.099	Arthur, 1971
Yellow Bullhead	96-hour TL-50	0.099	Arthur, 1971-72
Smallmouth Bass	Absent in streams	0.1	Tsai, 1971
White Sucker	7-day TL-50	0.132	Arthur, 1971-72
White Sucker	7-day TL-50	0.132	Arthur, 1971
Walleye	7-day TL-50	0.15	Arthur, 1971
Largemouth Bass	7-day TL-50	0.261	Arthur, 1971
Phytoplankton	50% reduction in photosynthesis and respiration	0.32	Brook & Baker, 1972
Largemouth Bass	12-hour TL-50	0.365	Arthur, 1971-72

* Median tolerance level (50 percent survival)

Source: Becker and Thatcher, 1973; Brungs, 1973 increased to 0.1 mg/l. The diversity then fell to zero at a concentration of 0.25 mg/l, and no fish at all were found in the water when the concentration was 0.37 mg/l. Tsai (1970) concluded that those species which are sensitive to low dissolved oxygen levels and organic enrichment decreased or disappeared in the area. They were then replaced by other species which were tolerant to the low dissolved oxygen levels and organic enrichment and were able to increase their abundance. Species found to be adversely affected included important game fish, the smallmouth bass, largemouth bass, and black crappie.

Arthur (1971-72, as cited in Brungs, 1973) studied the effects of chlorinated secondary wastewater treatment plant effluent containing only domestic wastes on the amphipod, *Gammarus pseudolimneaus*, and the water flea, *Daphnia magna*. He concluded that *Daphnia magna* is one of the more sensitve invertebrate species because it died when the residual chlorine concentration reached only 0.014 ppm. It did have acceptable reproduction at 0.003 ppm and below. The amphipod, *Gammarus pseudolimnaeus*, had its reproduction reduced by residual chlorine concentrations above 0.012 mg/l. There were no toxic effects observed when the same wastewater was dechlorinated with sulfur dioxide.

Although there have not been any known studies of the zooplankton assemblages in the Olentangy River, the common species of the water flea, *Daphnia*, probably exists in the river system. It is a very important food source for both young and mature fish (Pennak, 1953). The amphipod, *Gammarus*, is also a very common fish food and presumably is present in the Olentangy River system (Faulkner, 1975). Olive (1971) reported the amphipod, Hyallella, to be present in the river near Powell Road.

Arthur (1971-72, as cited by Brungs, 1973), using a calculated chlorine concentration of 0.03 mg/l, based on dilution of a measured concentration of 2.0 mg/l, found that phytoplankton photosynthesis was reduced by more than 20 percent of the value obtained with a similar experiment using effluent having no residual chlorine. This effluent was dechlorinated by sulfur dioxide.

The Wyoming Bioassay Laboratory in Grandville, Michigan (DeGrave, 1975) has conducted experiments on the effects of 100 percent dechlorinated effluent upon the following fish species: fathead minnow, bluegill, largemouth bass, pugnose shiner, pugnose minnow, common shiner, and golden shiner. The effluent had been dechlorinated by sulfur dioxide. Except for the pugnose shiner, no mortality was found to occur when the fish were subjected to a 100 percent effluent solution that was 100 percent dechlorinated. The pugnose shiner experienced a 25 percent mortality under these conditions. Reasons for this mortality are not known, but the information obtained by these experiements shows that the forage species and the largemouth bass and bluegill, could swim through 100 percent dechlorinated effluent and survive.

b. Removal Methods

Bromination and iodination are not commonly used for sewage treatment, being more costly than chlorination. Effluent disinfection by the addition of acids or alkalis requires large amounts of these substancies and then further requires neutralization of the effluent to pH 7. Only the chlorination-dechlorination and ozonation methods for disinfection and their cost-effectiveness are considered here.

In a plant the size of the proposed Delaware facility, chlorine as free chlorine gas is dissolved in a sidestream of water. Once the gaseous chlorine (Cl^-) goes into solution, it reacts almost immediately with the water (H_2O) to form hypochlorous acid ($HOCl$) and hydrogen and chlorine ions (H^+ and Cl^-). The hypochlorous acid ($HOCl$) ionizes to form hypochlorite ions (OCl^-) and hydrogen ions (H^+). The ratio between elemental chlorine (Cl^-), hypochlorous acid ($HOCl$), and hypochlorite ions (OCl^-) depends on the pH of the solution. At the anticipated pH level of the effluent, 6-7, hypochlorous acid ($HOCl$) should comprise 60-80 percent of the chlorine added, and elemental chlorine (Cl^-) should be almost absent. These three forms of chlorine are referred to as "free available chlorine residuals".

Ammonia (NH_3), present in the wastewater, reacts with the free available chlorine to form monochloramines (NH_2Cl), dichloramines ($NHCl_2$), and nitrogen trichloride (NCl_3). At the pH levels of wastewater, mono and dichloramines will predominate. These compounds are referred to as "combined available chlorine residuals" and have some disinfecting ability; however, this disinfecting property is considerably less than that of free available chlorine residuals (Fair and Geyer, 1963).

By the addition of additional chlorine and the provision of adequate detention time, the ammonia may be completely oxidized, resulting in the formation and release of elemental nitrogen gas. This process is referred to as "breakpoint chlorination" and is one method of nitrogen reduction in wastewater. In general, the chlorine dosage required to achieve breakpoint on a molar basis is twice that of the ammonia. The necessary contact time must be determined by on-site tests (Fair and Geyer, 1963).

In addition to reacting with water and ammonia, chlorine will also react with organic matter in the sewage, thereby reducing the BOD but also forming complex organic chloramines. Certain of these compounds are possible health hazards at high concentrations.

Free and combined available chlorine compounds at varying concentrations are toxic to aquatic organisms. Examples of the effects of various concentrations of chlorine residuals on various fish types are listed in Table H-1 (Brungs, 1973; Becker and Thatcher, 1973). The recommended safe level for chlorine residuals in warm-water aquatic systems is 0.003 mg/l (Brungs, 1976). Assuming a river flow rate of 3.06 MGD (4.73 cfs), the adjusted minimum release 7-day, once in 10-year low flow , and the effluent discharge of 1.5 mgd, the required residual chlorine concentration in the effluent, to keep the stream chlorine concentration below 0.003 mg/l, would be approximately 0.009 mg/l. For the 3.0 MGD facility, effluent chlorine concentrations of below 0.006 mg/l would be required.

Reduction of chlorine residuals in sewage effluents may be accomplished by various methods, including aeration, sulfur dioxide addition, or granular activated carbon filtration.

Aerating the chlorinated effluent for 15 minutes to 8 hours will reduce the concentrations of various related compounds including elemental chlorine (Cl_2), hypochlorous acid (HOCl), dichloramine ($NHCl_2$), and trichloramine (NCl_3) (Fair and Geyer, 1963; Hinde Engineering, 1975). Monochloramine, which is an important chlorine residual, is not removed. Consequently, the resulting residual chlorine concentration in the effluent is difficult to estimate without actual operating data. Aeration does not remove complex organic chloramines, but it increases the dissolved oxygen concentration in the effluent. The system would have to be re-designed for longer detention times.

Sulfur dioxide addition is another technique for dechlorination. Sulfur dioxide reacts with chlorine to form sulfuric and hydrochloric acids; consequently, a provision for pH adjustment should be provided. Sulfur dioxide in the gaseous state is dissolved in the chlorinated effluent until the concentration of SO_2 exceeds that of the residual chlorine. At residual chlorine concentrations of 2 and 4 mg/l, approximately 37.5 and 62.6 pounds per day of SO_2 are required. A relatively short contact time of ten minutes is required. The resulting residual chlorine concentration should be less than 0.01 mg/l. Complex organic chloramines are not removed by the addition of sulfur dioxide. Furthermore, chlorides and sulfates, as end products of the method, are left in the effluent. The increase of total dissolved solids load from this method ranges from 300 to 600 pounds per day added to the TDS load of 14,930 pounds per day for the plant at flow rate of 3 MGD.

Granular activated carbon may also be used for dechlorination. It is more commonly used to absorb organic matter and other compounds responsible for BOD and odor. Certain types of activated carbon systems, such as downflow units, also act as filters and remove suspended solids. Filtration may clog the downflow units and the BOD in the effluent may encourage the growth of microorganisms on the carbon. Backwashing of the downflow units reduces clogging and biological accumulations. Countercurrent upflow units do not clog, hence do not require backwashing. Absorption is a non-consumptive surface phenomenon, and the carbon can be regenerated and reused. In dechlorination, the chlorine is absorbed by the pores in the carbon granules and reacts with the carbon to produce carbon dioxide gas and hydrochloric acid. Therefore, in this process, carbon is consumed.

Activated carbon systems are more complicated and expensive to construct and operate than either aeration or sulfur dioxide units. A capital cost comparison of aeration, sulfur dioxide, and granular activated carbon dechlorination systems is presented in Table H-3. A sulfur dioxide system has the lowest capital cost; the aeration units, depending on electrical rates, should have the lowest operating costs. Aerating systems, however, do accomplish the necessary goal of increasing the dissolved oxygen concentration in the effluent. A combined system using aeration and sulfur dioxide might be very cost-effective. The aeration time required to raise the dissolved oxygen concentration is less than the aeration time necessary to dechlorinate.

Assuming that the effluent prior to discharge has a dissolved oxygen concentration of 1 mg/l and that the final effluent must have 5 mg/l, then 4 mg/l or approximately 50 pounds of oxygen per day must be added. A typical design figure for aeration units is four pounds of oxygen transferred per horse power hour. At this rate, approximately 96 pounds of oxygen per day could be provided by a one horsepower unit.

Allowing for BOD, residual dissolved oxygen requirements, and continuous supply regulation, 2, two-horsepower units would be needed. With a one hour detention time (instead of 8 hours), this system should be able to meet dissolved oxygen requirements. For dechlorination, sulfur dioxide could be fed into the tank using the air bubbles for mixing. This hydrid system is more expensive than the single dechlorination system, such as aeration or sulfur dioxide addition, but it appears to be the least expensive dual purpose system.

The dechlorination capacity depends on the residual chlorine concentration in the chlorinated wastewater. A pH of 7, a temperature of 21°C, a final residual chlorine concentration of 0.01 mg/l, and loading of 1 gpm flows/ft. of carbon are assumed for the purpose of subsequent calculations. Using these assumptions, the dechlorinating life of 1042 cubic feet of granular activated carbon for incoming residual chlorine concentration of 2 and 4 mg/l is 5.3 and 1.7 years, respectively. Attaining a residual chlorine concentration of only 0.003 mg/l maybe more costly, however.

TABLE H-3. Costs of Various Dechlorination Processes

Process	Capital Cost in $ (1.5 MGD plant)	Operating Cost in $/1000 gal.
Aeration	150,000	-----------
Sulfur Dioxide	50,000	.016
Granular Activated Carbon	300,000	.011
Combined Aeration, Sulfur Dioxide	80,000	.016+

Source: Calgon Corporation, 1975;
Hinde Engineering Corporation, 1975

Many complex organic compounds including chlorinated forms will be absorbed into the carbon surface. The resulting effect on the dechlorinating ability of the carbon should not be significant and the overall quality of the final effluent should be improved.

Use of ozone as a disinfectant as compared to conventional chlorination and dechlorination is increasing for a number of reasons. Ozone is a highly effective disinfectant and leaves no residuals and no dissolved solids. In addition to the bacterial kills, ozone treatment can purge virus particles and pollutants, such as surfactants, that survive treatment with chlorine. Ozone is also capable of higher reduction of residual BOD and total organic carbon (TOC) than carbon absorption polishing, and is fully cost competitive. Furthermore, ozone is more effective than chlorine against the major taste-and-odor causing compounds, such as phenols and amines. Chlorination merely converts these into compounds that are less resistant to oxidation (Environmental Science and Technology, 1970).

The effluent at the proposed plant will undergo tertiary filtration prior to disinfection. This will ensure greater disinfection efficiency.

In the process of ozonating effluent considerable amounts of air or oxygen are introduced into the waste, thus increasing the dissolved oxygen level of the receiving stream. Therefore, if the ozonation process were to be adopted for the project, the post-aeration process could be eliminated.

The two major inputs for a typical ozonation system are air or oxygen, and electricity. The air usually is first cleaned by filtration, its moisture removed by a refrigerative unit, and further conditioned by an air absorptive dryer prior to ozonation. Electrodes of up to 20,000 volts are used to produce a corona in the air supply to generate ozone. The concentration of ozone generated is approximately 1 percent per volume of air. If pure oxygen is used as the feed gas, the ozone output can be increased to 2 percent by volume. A contact chamber or ozone tower is used to affect the transfer of ozone from the gas phase to the water phase.

Recent research has indicated that both sulfur dioxide dechlorination and ozonation do not have toxic effects on freshwater aquatic life (Arthur _et. al._ 1975). Both methods will produce the desired level of disinfection at similar cost levels. While chlorination-dechlorination costs drop more rapidly than ozone at the larger treatment plant sizes, ozone costs would be absorbed in the lower total unit costs of treating wastewater at a larger facility.

EPA's Municipal Environmental Research Laboratory had provided the following cost comparisons (capital and O&M), based on 1974 data:

Table H-4. Total Treatment Costs for Disinfection Alternates ($/ 1000 gallons)

Plant Size, MGD	1.0	1.5	3.0	10.0
Chlorination-SO_2 Dechlorination Post aeration	0.077	0.058	0.040	0.024
Ozonation (produced from air)	0.073	0.063	0.052	0.040

Since 1974, chlorine prices have increased 12% and sulfur dioxide prices have increased 18%. Construction costs have increased 11% during the same period. Disinfection costs are only about 15% of the total cost of sewage treatment.

Ozone has additional advantages. It will not leave any residual compounds in the water, such as chlorinated hydrocarbons, and will not contribute additional total dissolved solids. The storage and handling of toxic chemicals will be largely reduced, for chlorine, or eliminated, for sulfur dioxide. This will help to reduce potential accidents, in the event of any mechanical breakdown. Ozone production is done on-site, according to demand. The systems are wired in an interlock fashion for a fail-safe operation, with a remote master switch for instantaneous complete shutdown. An ozone destruction stystem would be included so that there would be no ozone discharge outside the system. Since ozone does not produce a residual concentration that can harm aquatic organisms, it is particularly desirable for this ecologically valuable section of the Olentangy River. Ozone has been used for many years to disinfect water supplies. Two full scale wastewater treatment plants are in operation using ozone, Mahoning Valley Sanitation District, Ohio (4MGD), and Upper Thompson Sanitation District, Colorado (1.5 MGD). Several others are at the equipment bid stage, according to the Municipal Environmental Research Laboratory.

Because of the substantial environmental benefits, ozonation is recommended for this system. Ozone costs may be slightly higher than chlorination-dechlorination, but are cost-effective to protect high biological value of the Olentangy River.

2. Ammonia Impacts

Cell membranes are relatively impermeable to the ionized form of ammonia (NH_4^+), but undissociated un-ionized species (NH_3) can readily cross cellular barriers (Milne et al., 1974). Tabata (1962 as cited in Thurston et al., 1974) attributes some degree of toxicity to invertebrates and fishes to the NH_4^+species, as well.

Elis (1968 as cited by Ohio Fish and Wildlife Service, Faulkner, 1975) has found that exposing carp to sublethal concentrations of undissociated ammonia in the ranges of 0.11 and 0.34 mg/l caused rather extensive decay and tissue disintegration in various organs. Robinette (1974 as cited by McKim et al., 1975) conducted laboratory experiments with channel catfish fingerlings to evaluate the effects of sublethal concentrations of ammonia. He found that there was a significant growth reduction at 0.12 and 0.13 mg/l of ammonia. Further studies indicated that there was no significant difference in the oxygen uptake between the control and experimental fish. Microscopic evaluation of the gills of the fish revealed that all fish exhibited hyperplasia (an abnormal increase in the number of cells of a tissue or organ). The fish that were exposed to the highest concentrations of sublethal un-ionized ammonia-nitrogen displayed the greatest degree of hyperplasia.

Table H-5 presents the percentage of undissociated aqueous ammonia that could be present in the plant's discharge at the various pH ranges possible for the effluent. These percentages are based on the equilibrium constants for dissolved undissociated ammonia and the ammonium ion, NH_4^+. The relative percentage of these species is also governed by the water's temperature.

Table H-5. The Percent Distribution of Aqueous Ammonia Species at Various pH Values and Temperatures

Species	pH value				Temperature in oC
	7	7.5	7.7	8	
$NH_3 \cdot nH_2O$ aqueous	0.566	1.77	2.77	5.38	25
NH_4^+	99.434	98.23	97.23	94.62	25
$NH_3 \cdot n\,H_2O$ aqueous	0.273	0.859	1.35	2.67	15
NH_4^+	99.727	99.141	98.65	97.33	15

Source: Thurston _et_ _al_., (1974)

The pH value recorded by Olive (1971) for the Olentangy River near Powell Road was 9.5. The effluent's pH values from the plant, according to its permit, can range from 6 to 9. The pH value of the effluent will, of course, vary, but it will usually be near a pH of 7 or slightly higher.

At the initial 1.5 MGD capacity, the plant effluent would contribute about one third of the flow in the river during an extreme low flow period of 4.73 cfs. The effluent plume, then, would experience a pH increase from 7 to 8 upon mixing with the river water. As shown in Table H-5, the percentage of aqueous undissociated ammonia will increase almost by a factor of 10 when the pH value is raised from 7 to 8 at both the 15°C and 25°C temperatures. These two temperatures are within the range commonly experienced by the river. The increase of the aqueous undissociated ammonia, the toxic form of NH_3, by a factor of 10 when the pH changes from 7 to 8 does not necessarily mean that the plume's toxicity to the fish will be increased 10 times. This relationship is not definitely known, but this increase indicates that the fish within the mixing zone of the effluent plume would be more likely to be harmed than would fish outside the mixing zone.

When the plant's capacity is expanded to 3 MGD, the plant's effluent would contribute about half of the river's flow during the low flow condition of 4.73 cfs. The plant effluent plume would undergo a pH increase from 7 to 7.74 when mixing with river water at a pH of 8.5. As shown in Table I-5 this would increase the percentage of aqueous undissociated ammonia by a factor of 5 at both the 15°C and 25°C temperatures.

The zone of the river downstream in which complete effluent plume and river water mixing has occurred would have the undissociated ammonia species present at the increased pH levels described above. This portion of the river would have complete cross channel mixing of the effluent and therefore the fish in the downstream stretch of the river would potentially be exposed to increased concentrations of the toxic form of ammonia, the undissociated ammonia species. Because of the toxicity of ammonia to fish, the U.S. Fish and Wildlife Service (Appendix J) has recommended a water quality limit of 0.02 mg/l of undissociated ammonia.

The average streamflow at the Worthington gage, below site OR-3, is 441 cfs. Assuming a concentration of 1.5 mg/l of total ammonia in the effluent, the total ammonia concentrations will be 0.008 mg/l for the 1.5 MGD plant and 0.016 mg/l for the 3.0 MGD plant under these average flow conditions. Unionized ammonia will be much less, depending upon the temperature and pH variables indicated in Table H-5. Ammonia values become more critical at low streamflow conditions at 25°C:

Table H-6. Instream Ammonia Concentrations

flow	1.5 MGD	3.0 MGD
4.73 cfs (adjusted minimum release 7-day, once in 10-year low flow)	0.495 mg/l	0.744 mg/l total ammonia
	0.027 mg/l (pH 8)	0.021 mg/l unionized ammonia (pH 7.7)
9.70 cfs (historical modified 7-day, once in 10-year low flow)	0.291 mg/l	0.486 mg/l total ammonia
	0.016 mg/l (pH 8)	0.013 mg/l unionized ammonia (pH 7.7)

Note that the lower pH values resulting from the increased effluent flow at 3.0 MGD mitigate the amounts of unionized ammonia at 25°C. The ammonia equilibrium, as can be seen from these values and the variable percentages of Table H-5 is extremely sensitive to pH and to temperature, so the condition of the Olentangy at the discharge point for this proposed treatment facility will greatly influence the toxic unionized ammonia impacts of the effluent. All of these calculations have been based upon the assumption that there is no ammonia in the river prior to the addition of this effluent. Under these conditions, unionized ammonia is under the 0.02 mg/l limit for the 9.7 cfs low flow, the lowest 7-day, once in 10-year value recorded for the Olentangy since stream regulation, and is slightly over the limit for unionized ammonia at the low flow of 4.73 cfs, calculated from the minimum release of 5.0 cfs during a drought period. Low flow values are explained in greater detail in Chapter 2.

Problems arise, in that there are existing ammonia concentrations in the Olentangy River, before it approaches the Delaware-Franklin County line. STORET data have indicated these mean ammonia values in the sampling of Delaware Lake in 1973:

0.052 mg/l	April 26
0.139 mg/l	August 1
0.107 mg/l	October 10

Additional ammonia is contributed to the stream from the Delaware City sewage treatment plant. Furthermore, streams have some natural buffering capacity, and a natural tendency to nitrify, resulting in a very dynamic situation.

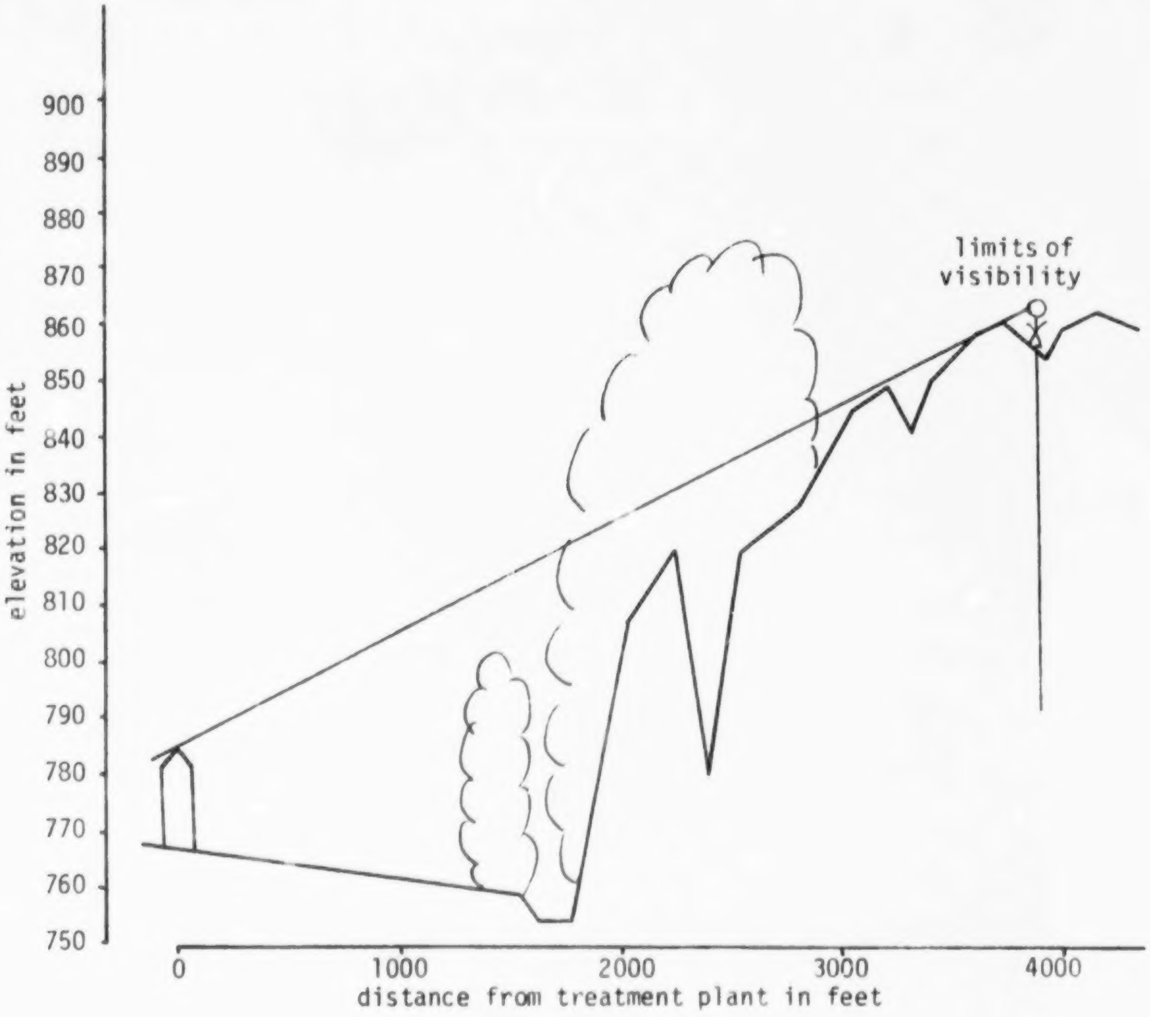
Ohio EPA has modeled this section of the Olentangy. However, the modeling has used a 7-day, once in 10-year low flow value of 13 cfs. At the county line, we have used the value of 9.7 cfs for equivalent histoorical conditions. The latter value was calculated by USGS (See Appendix J). The flow value used for the proposed treatment plant was 4.5 cfs, which is just under 3.0 MGD. The effluent ammonia value used was 1.0 mg/l, whereas the permit maximum is higher at 1.5 mg/l. With the assumption that performance at the Delaware City treatment plant is improved (grants are in progress) and that the Worthington Hills plant is eliminated (scheduled for 1977 by its permit conditions), unionized ammonia levels of more than 0.02 mg/l are foreseen during June and the first 10 days of July. Upstream impacts are also above 0.02 mg/l at the end of July; however water quality standards will not be violated at the Worthington Hills gaging station, according to OEPA modeling. With the reduced low flow values and the slightly higher ammonia level chosen for our calculations, impacts would be more severe.

All of these concentrations will be improved, if high treatment efficiency results in less that the 1.5 mg/l permit limit, as is anticipated. As discussed in Chapter 4, the nitrification treatment process which the plant will employ can be highly effective, as evidenced by the El Lago, Texas facility. Comparable treatment efficiency at this plant would result in an effluent value about one third less than the standard, 95 percent of the time, and that effluent value would be three quarters less than the standard, 50 percent of the time, as shown in Chapter 4.

APPENDIX I

VISABILITY ANALYSIS

The following 16 figures describe vertical profiles of the landscape in 16 different directions from the proposed site. Figure 41 on page 262 describes the direction and extent of each profile. Each of the profiles in this appendix shows the proposed STP on the left. The placement of the STP in no way affects the accuracy of the determined limits of visability.



PROFILE 1

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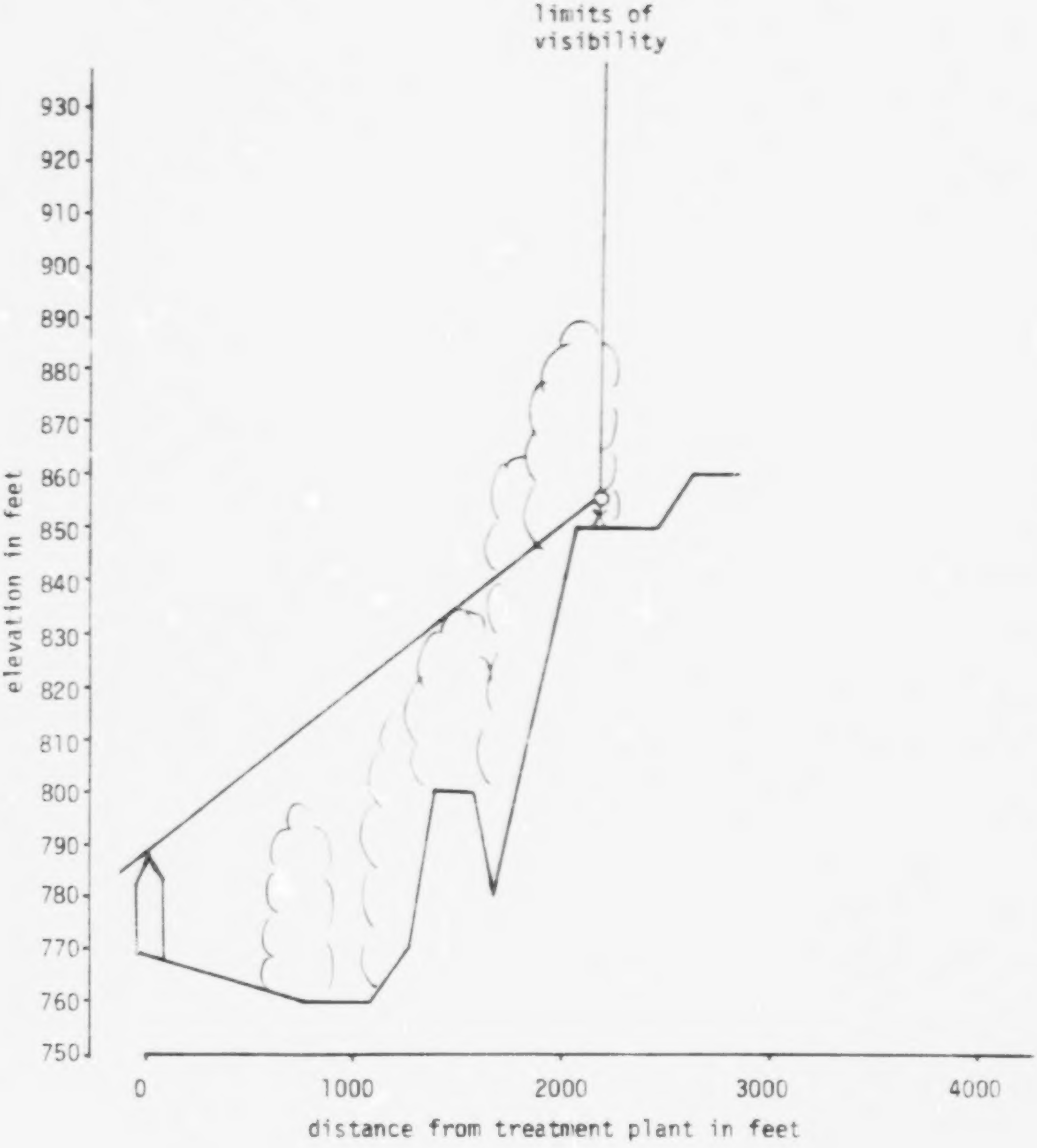

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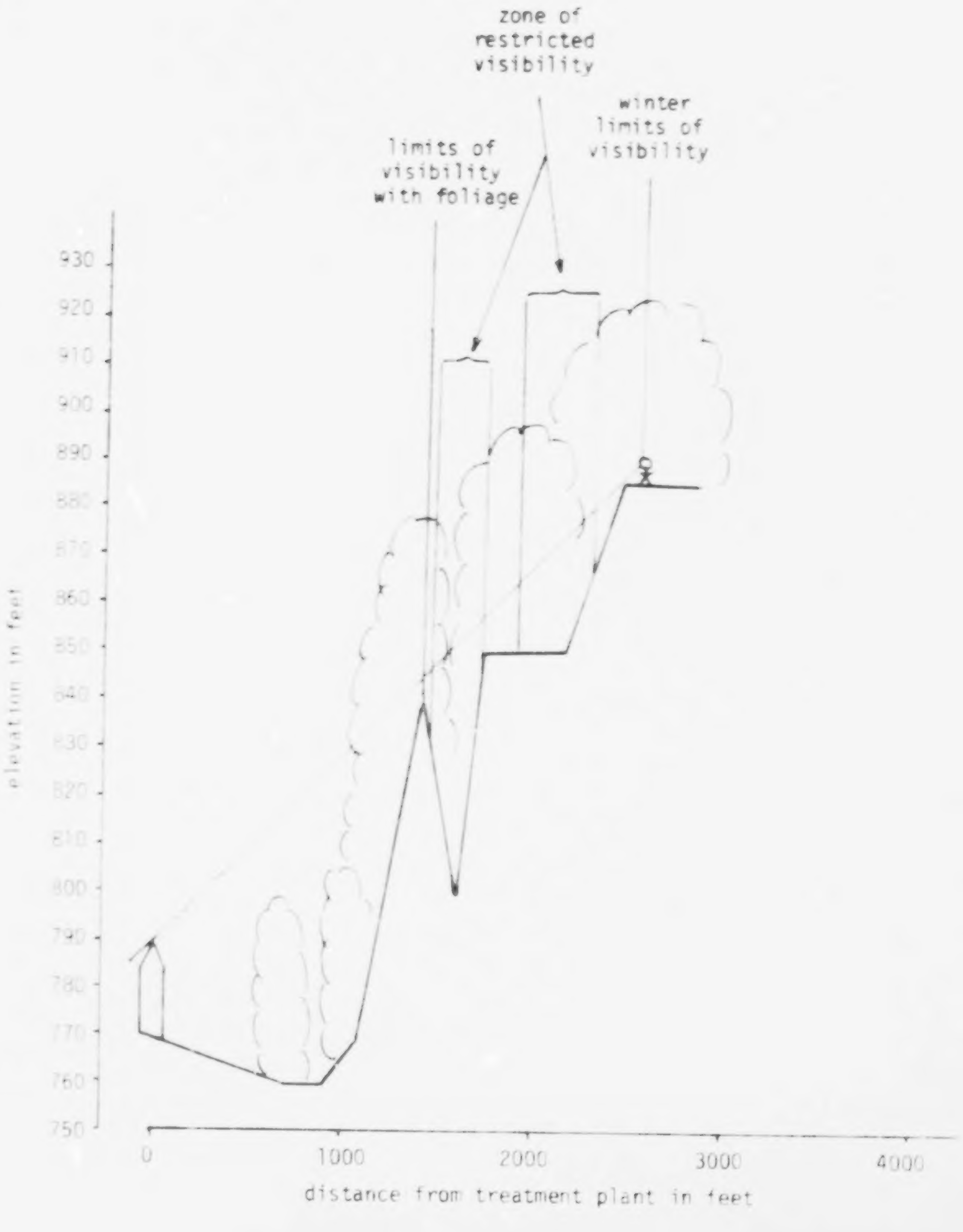

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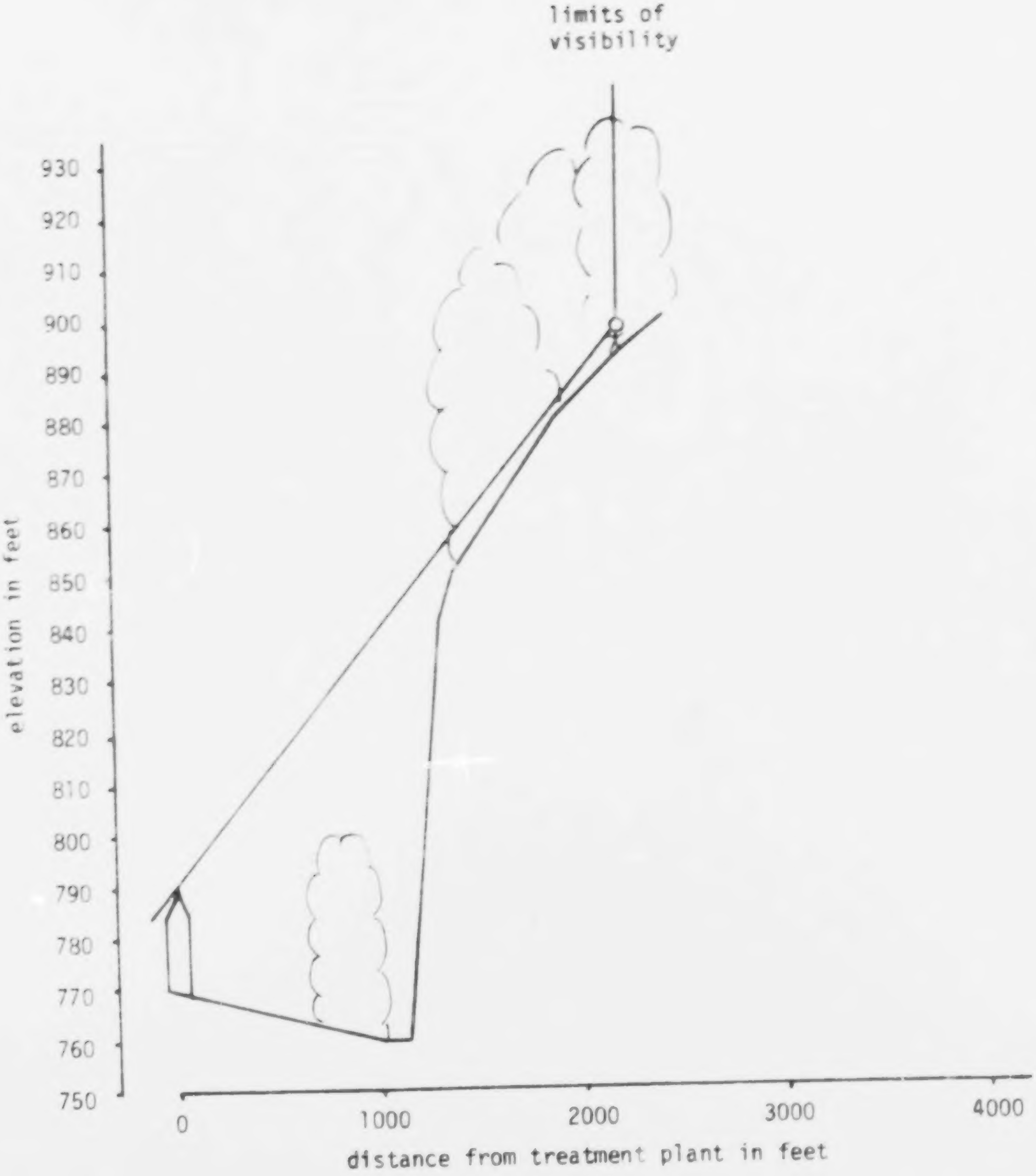

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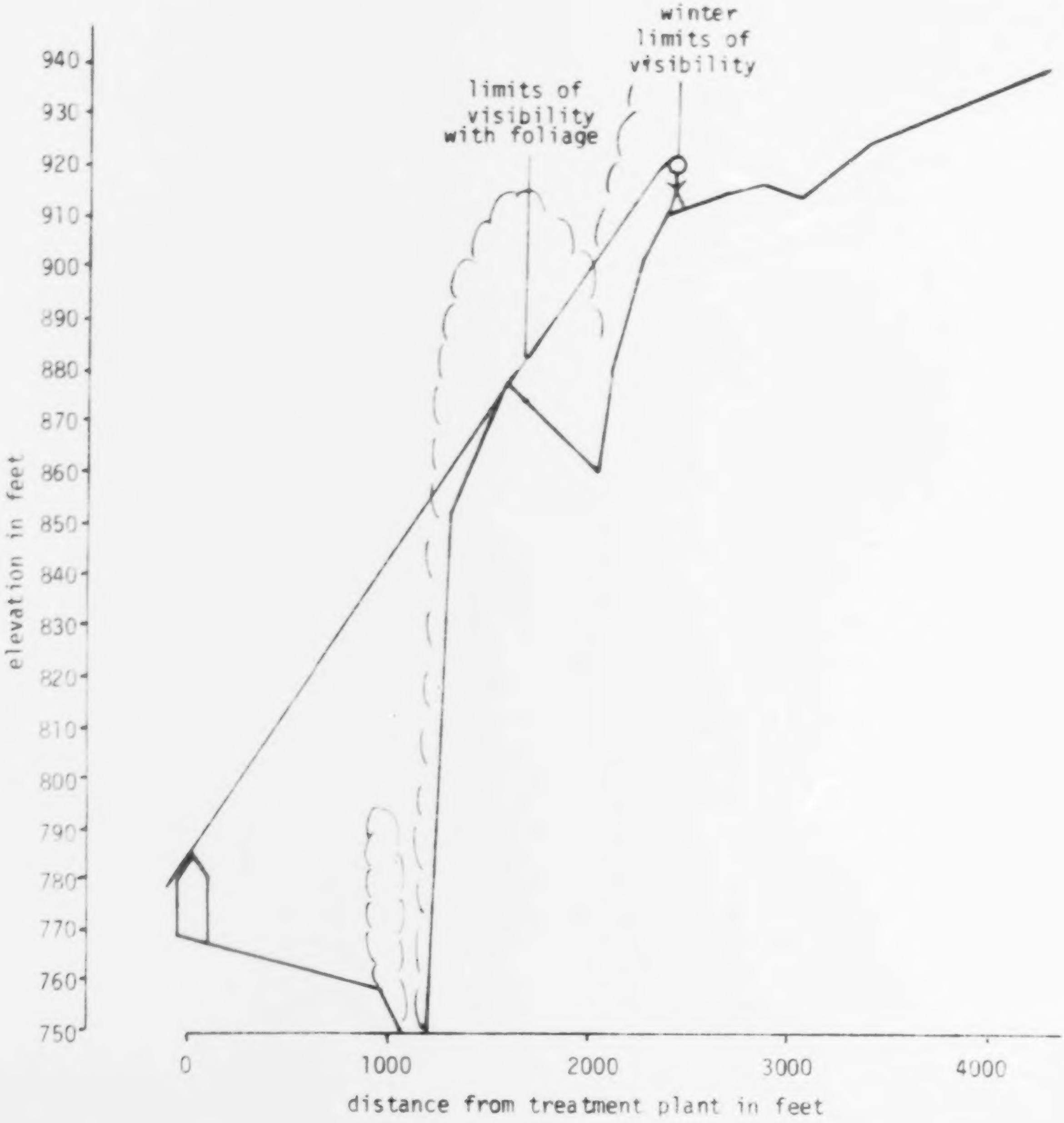

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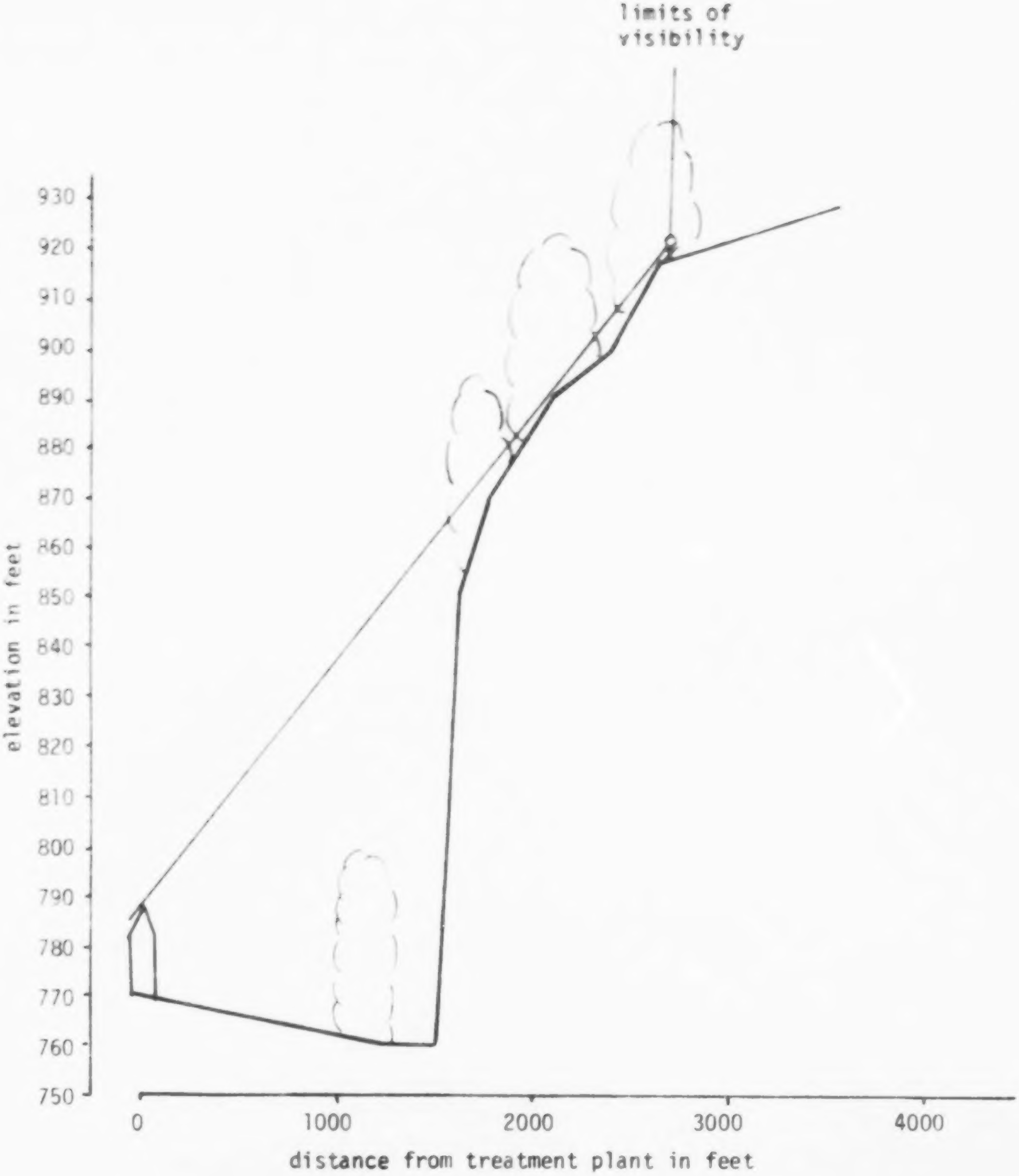

PROFILE 6

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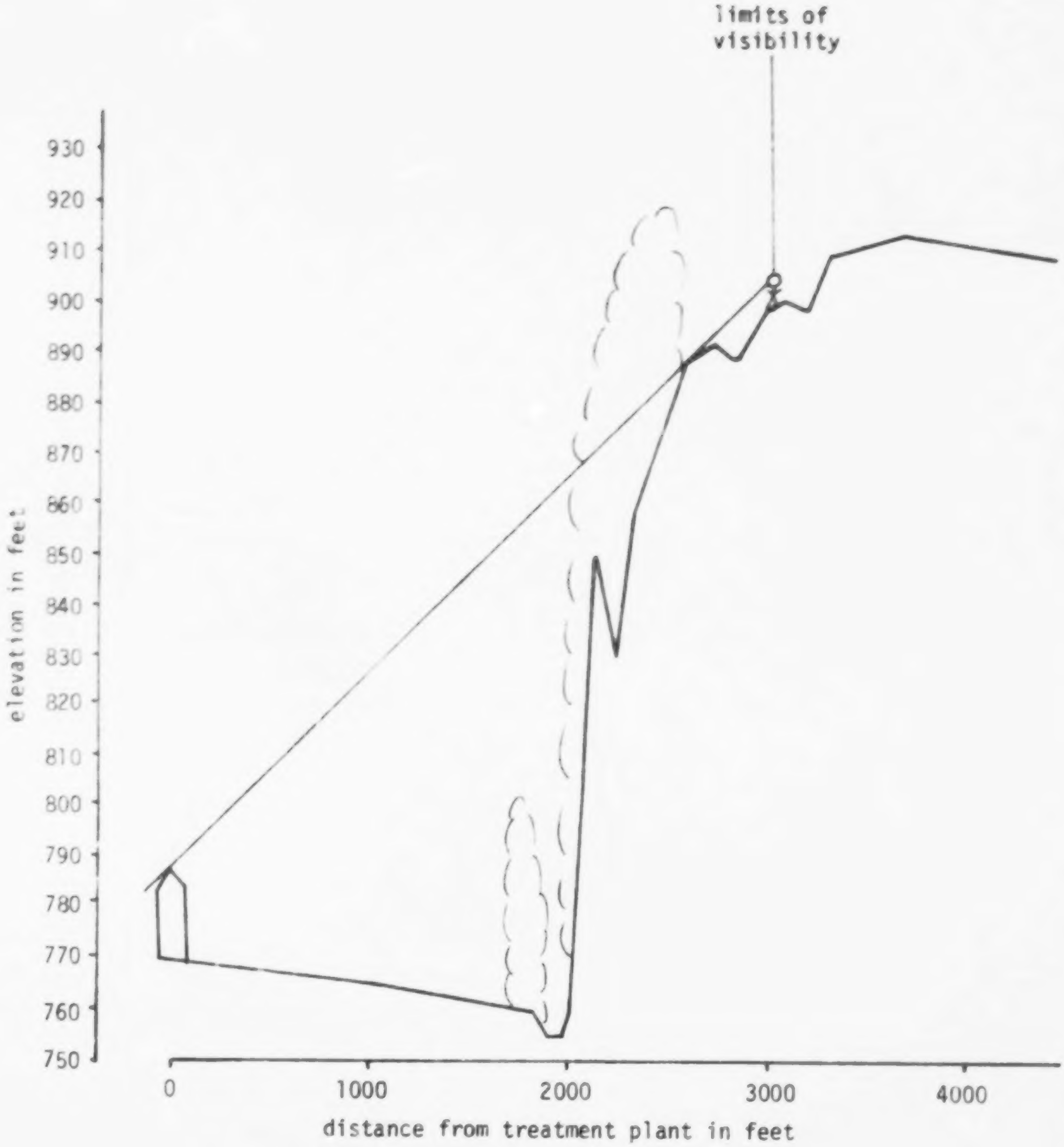

PROFILE 7

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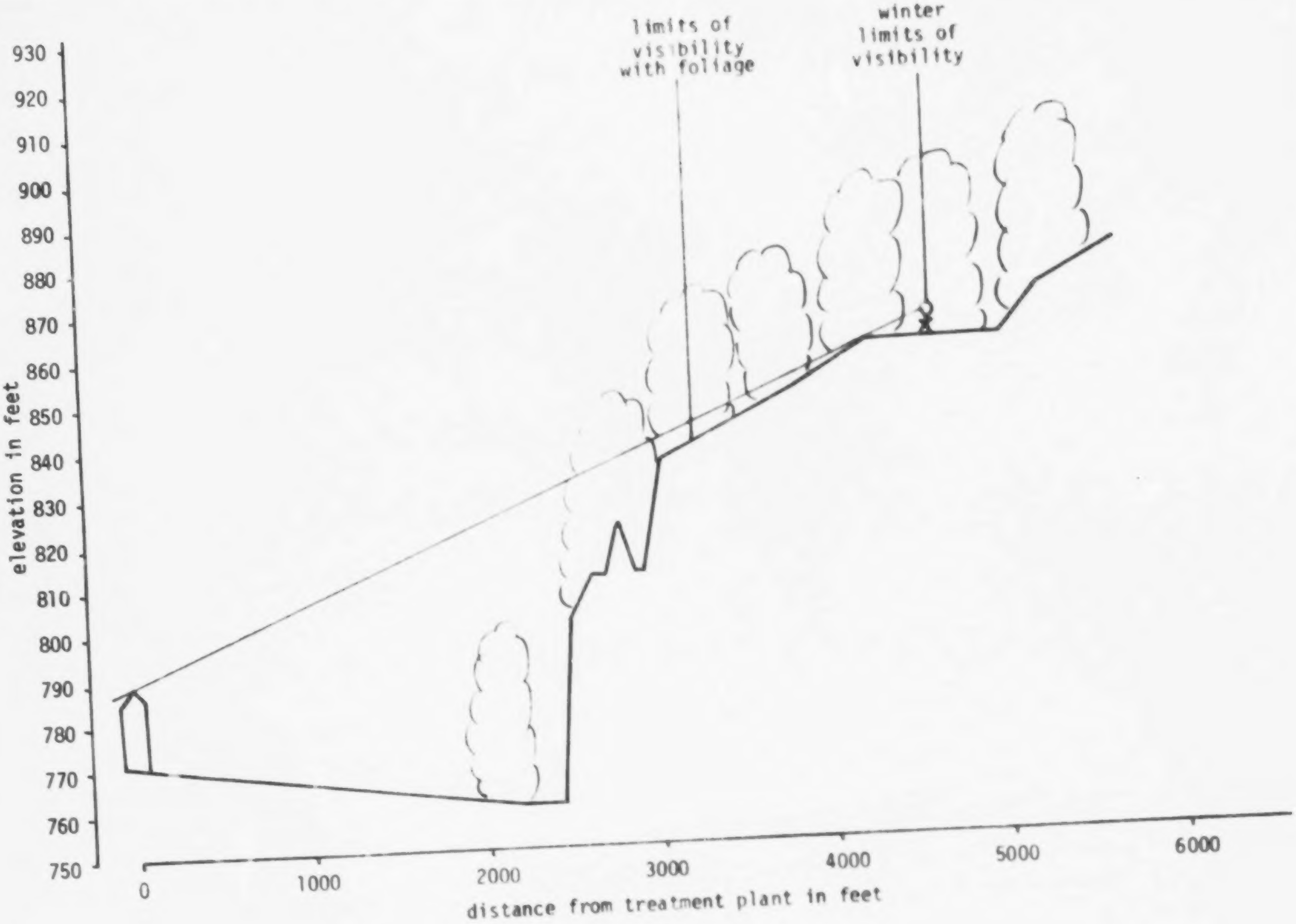

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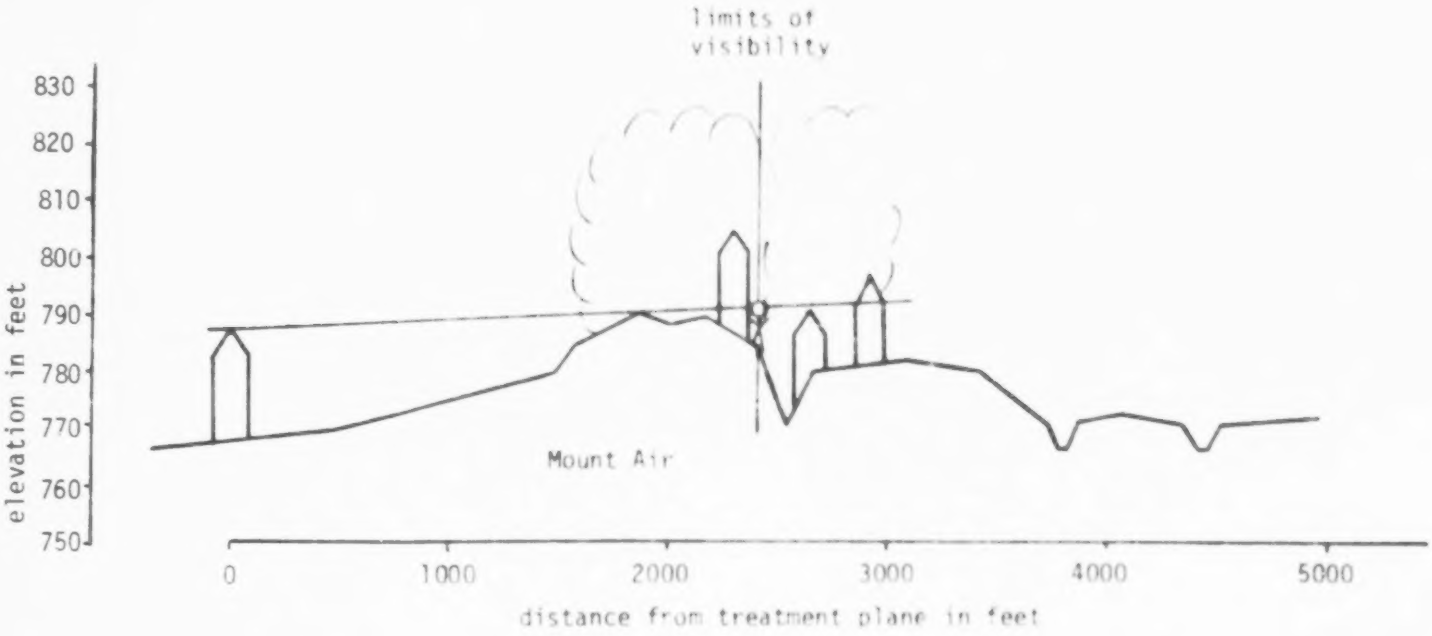

PROFILE 9

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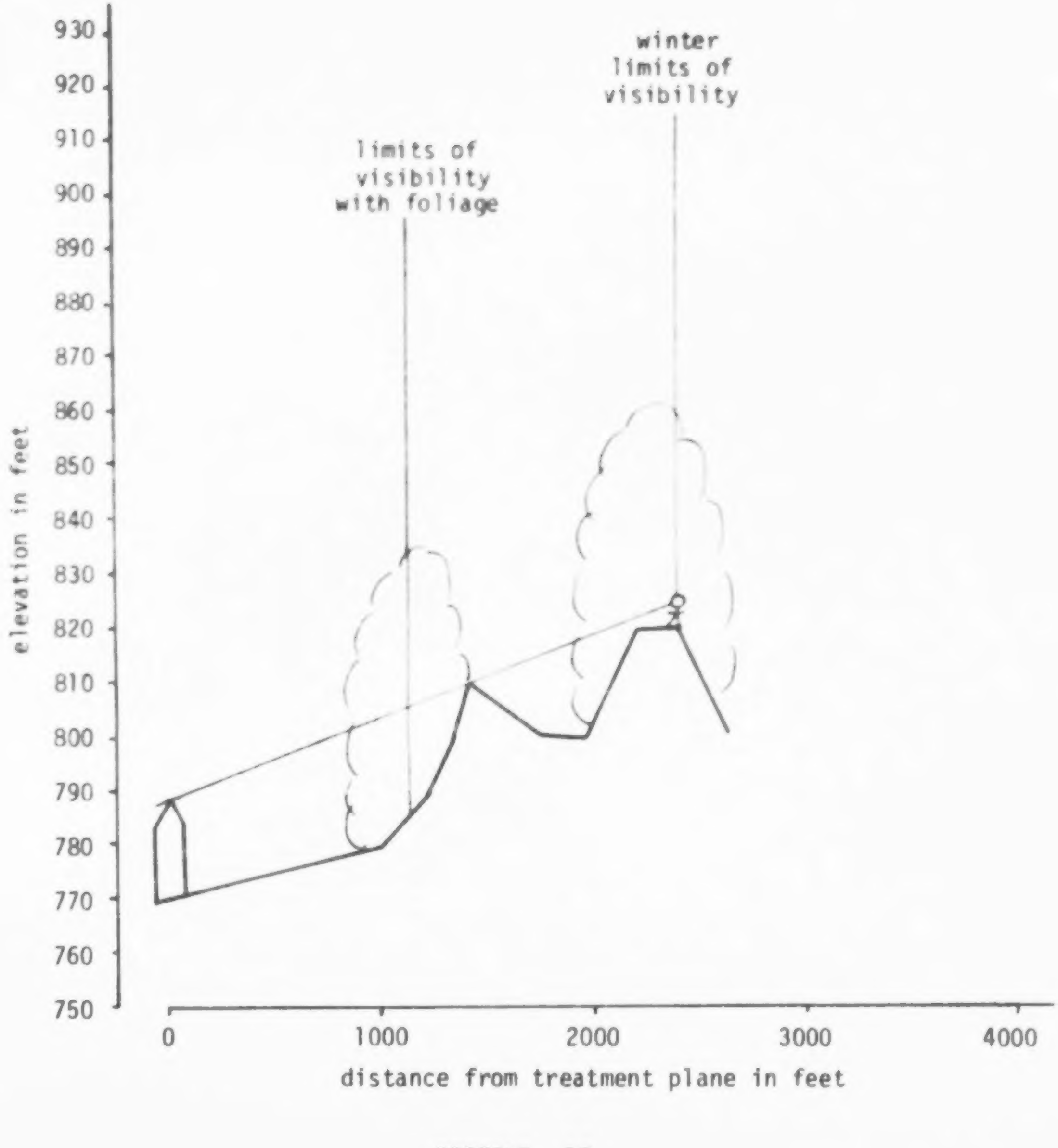

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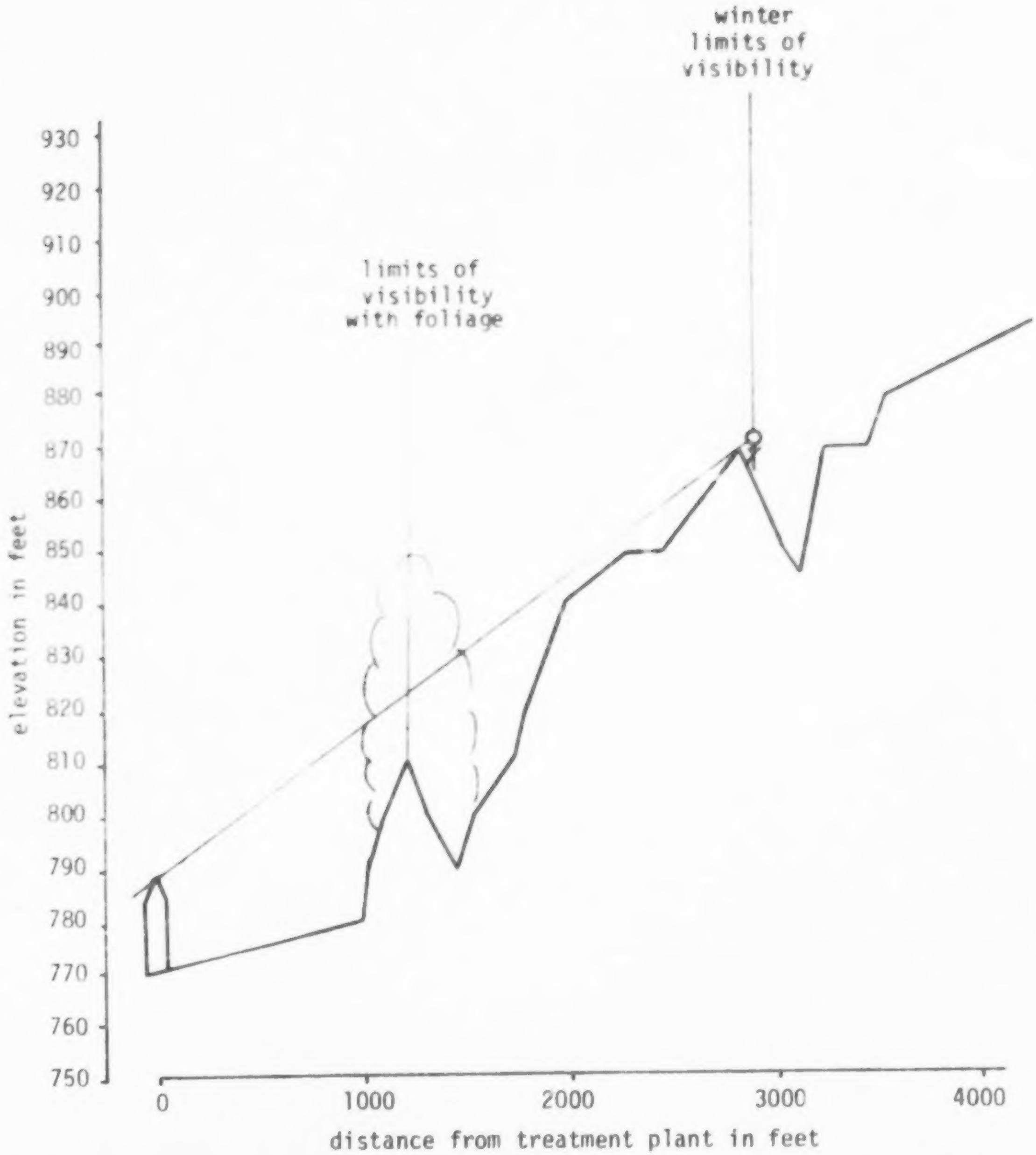

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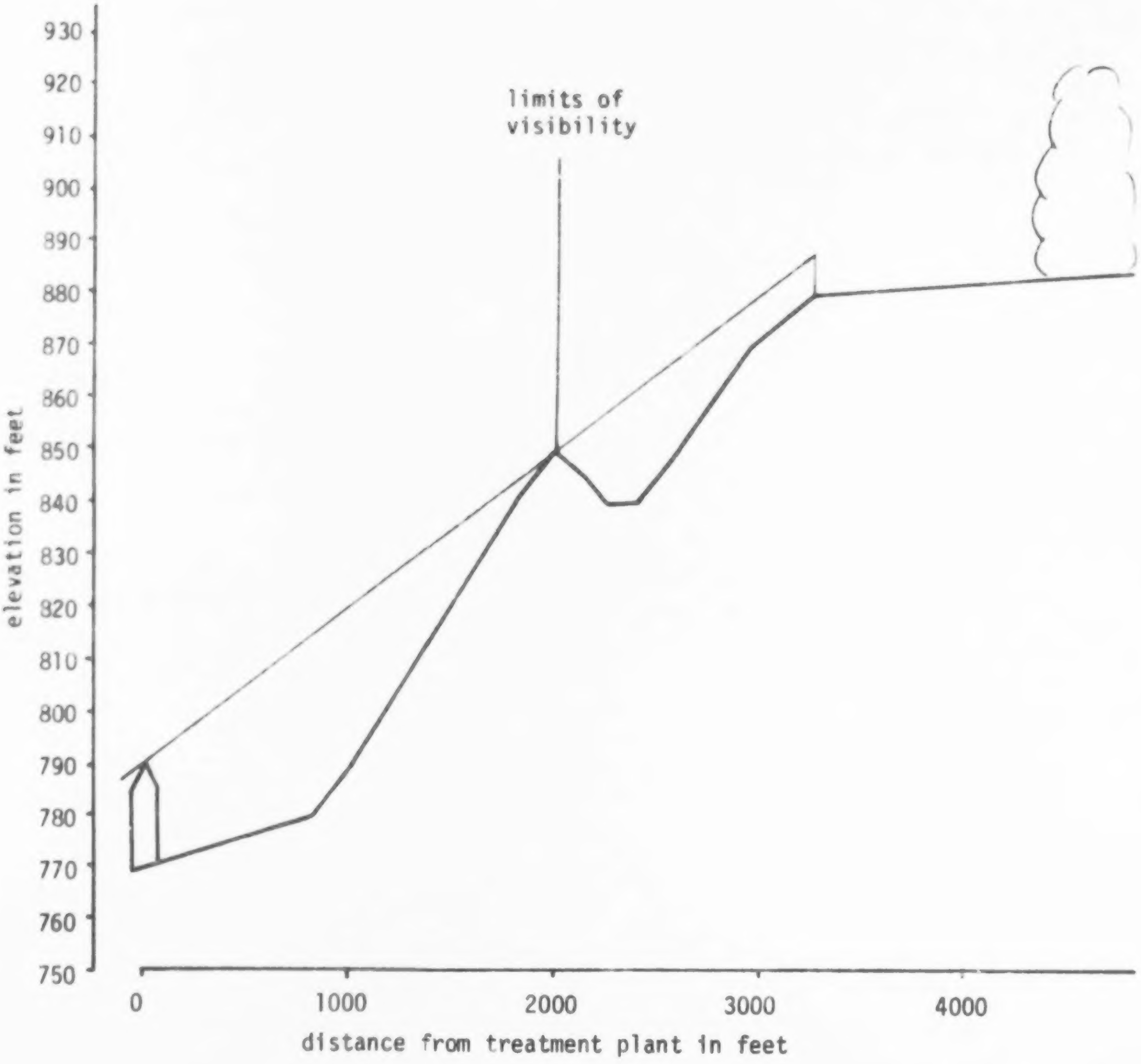

PROFILE 12

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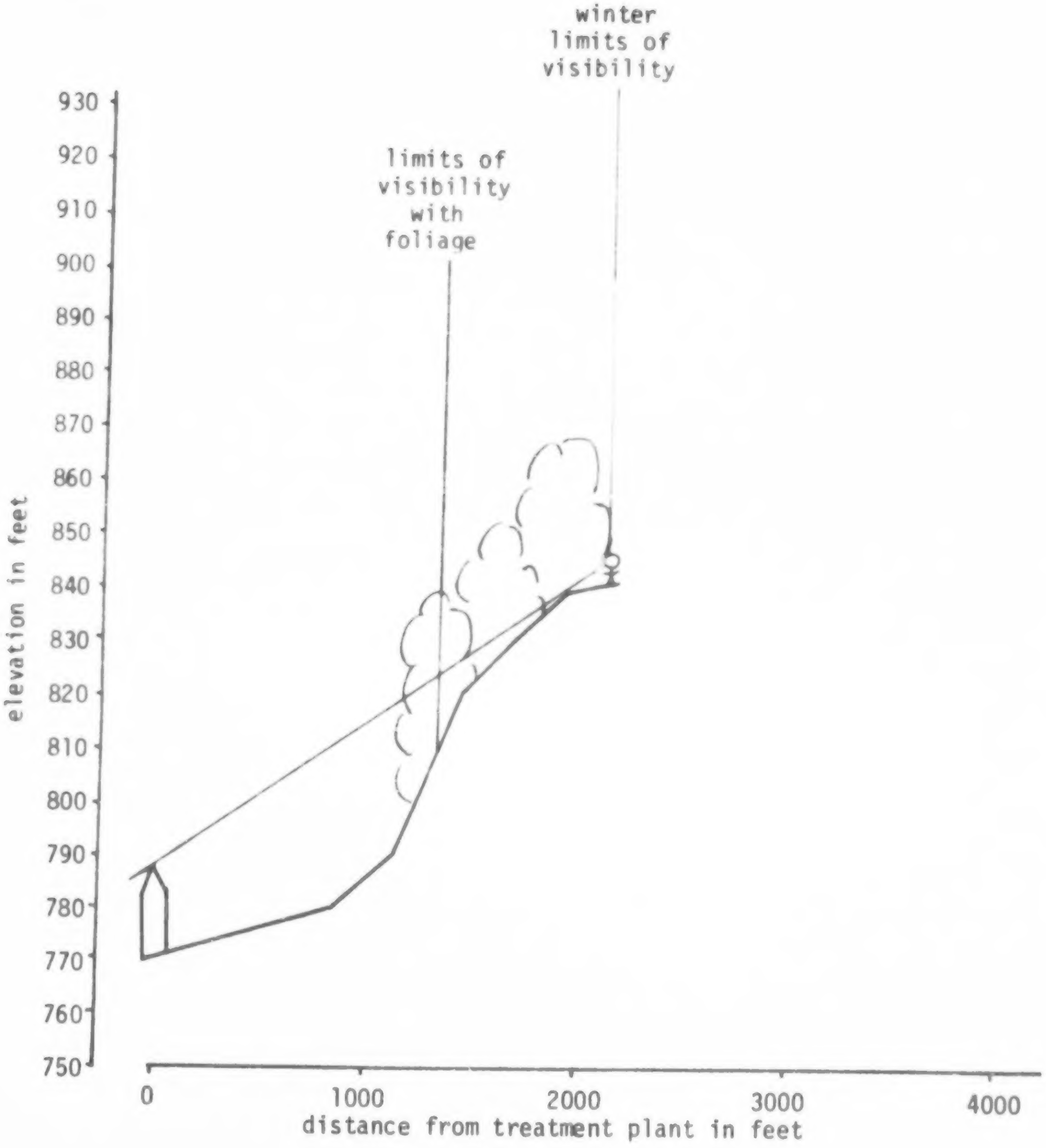
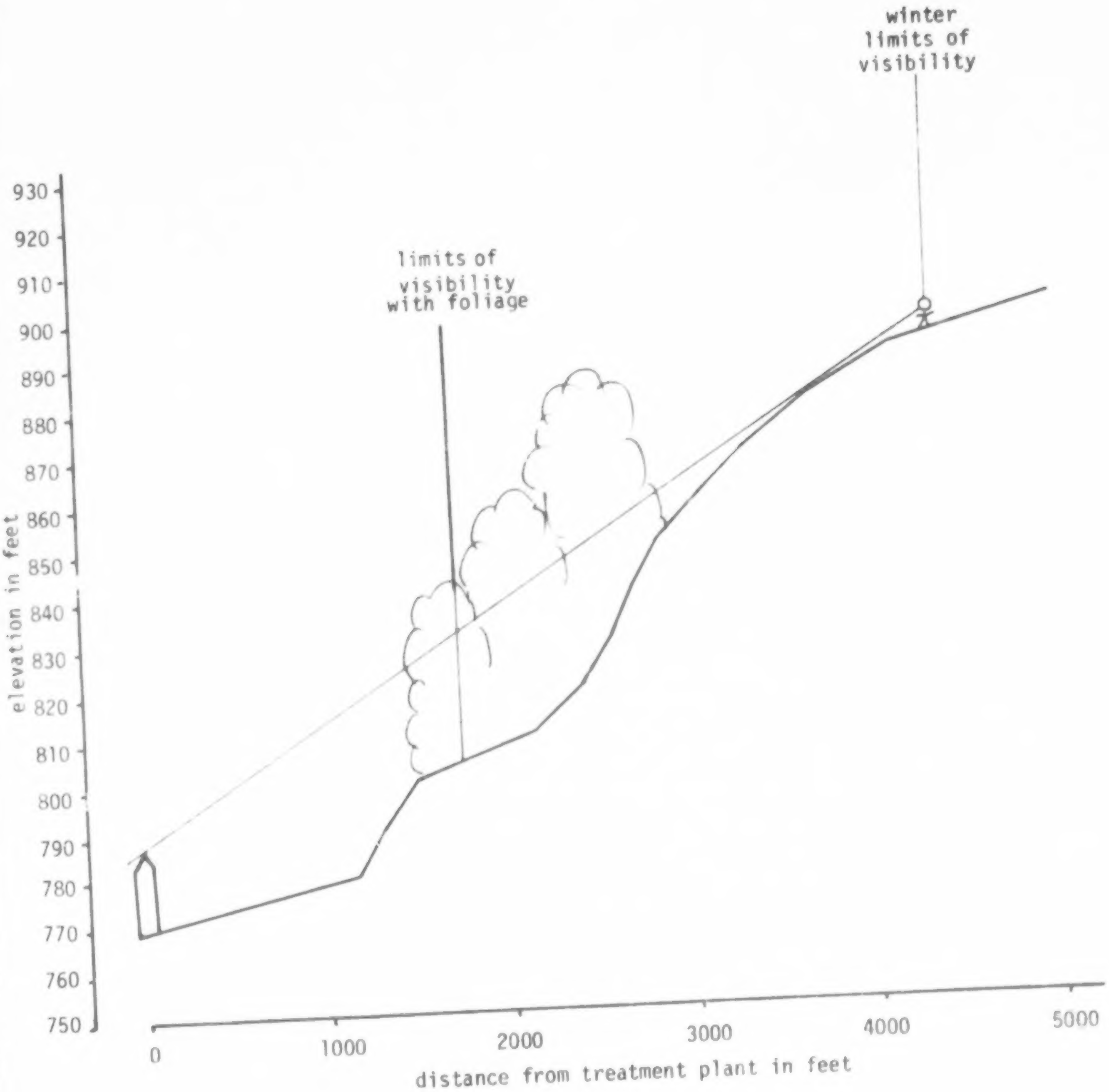


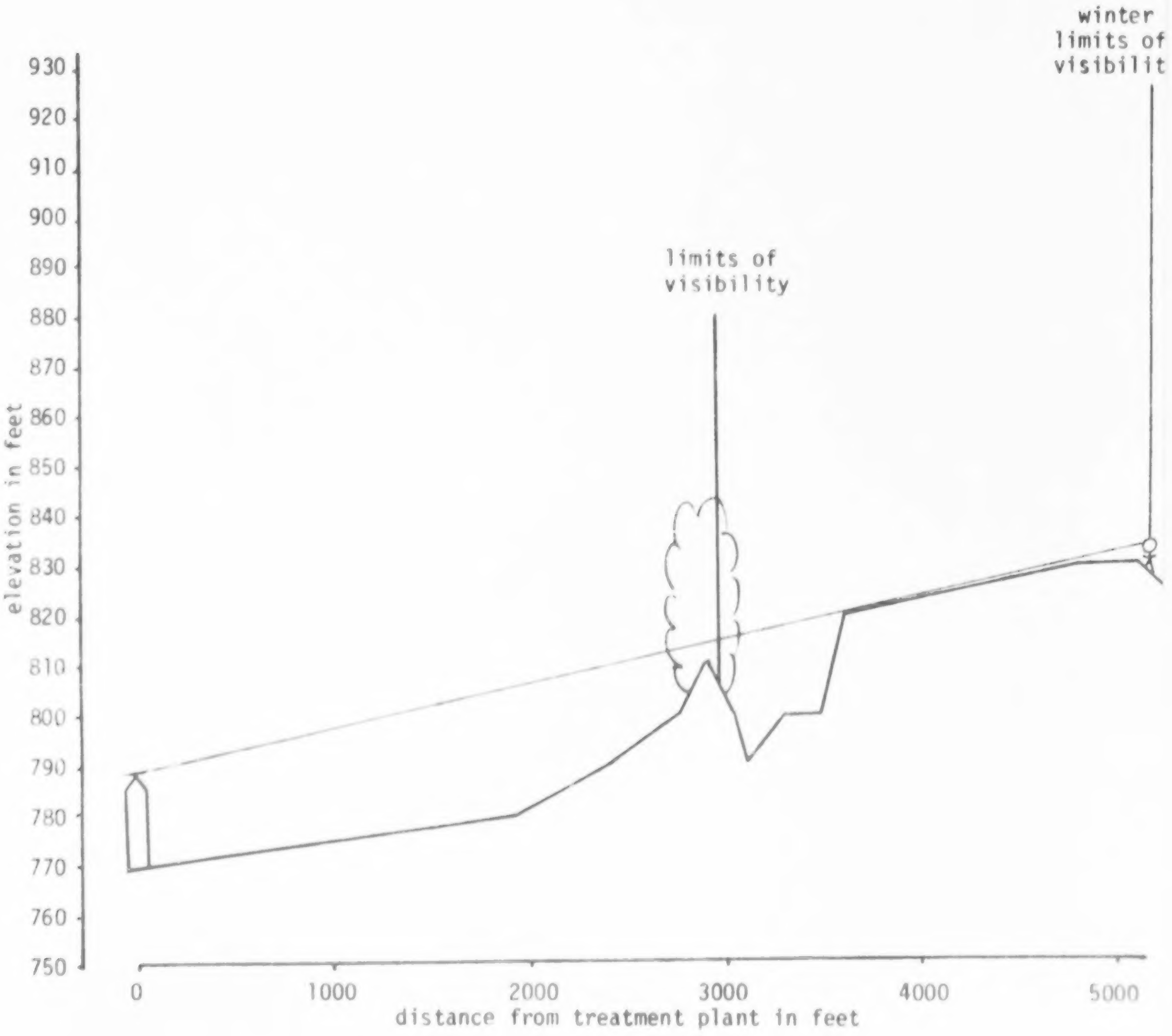
PROFILE 13

Source: Enviro Control, Inc., 1975



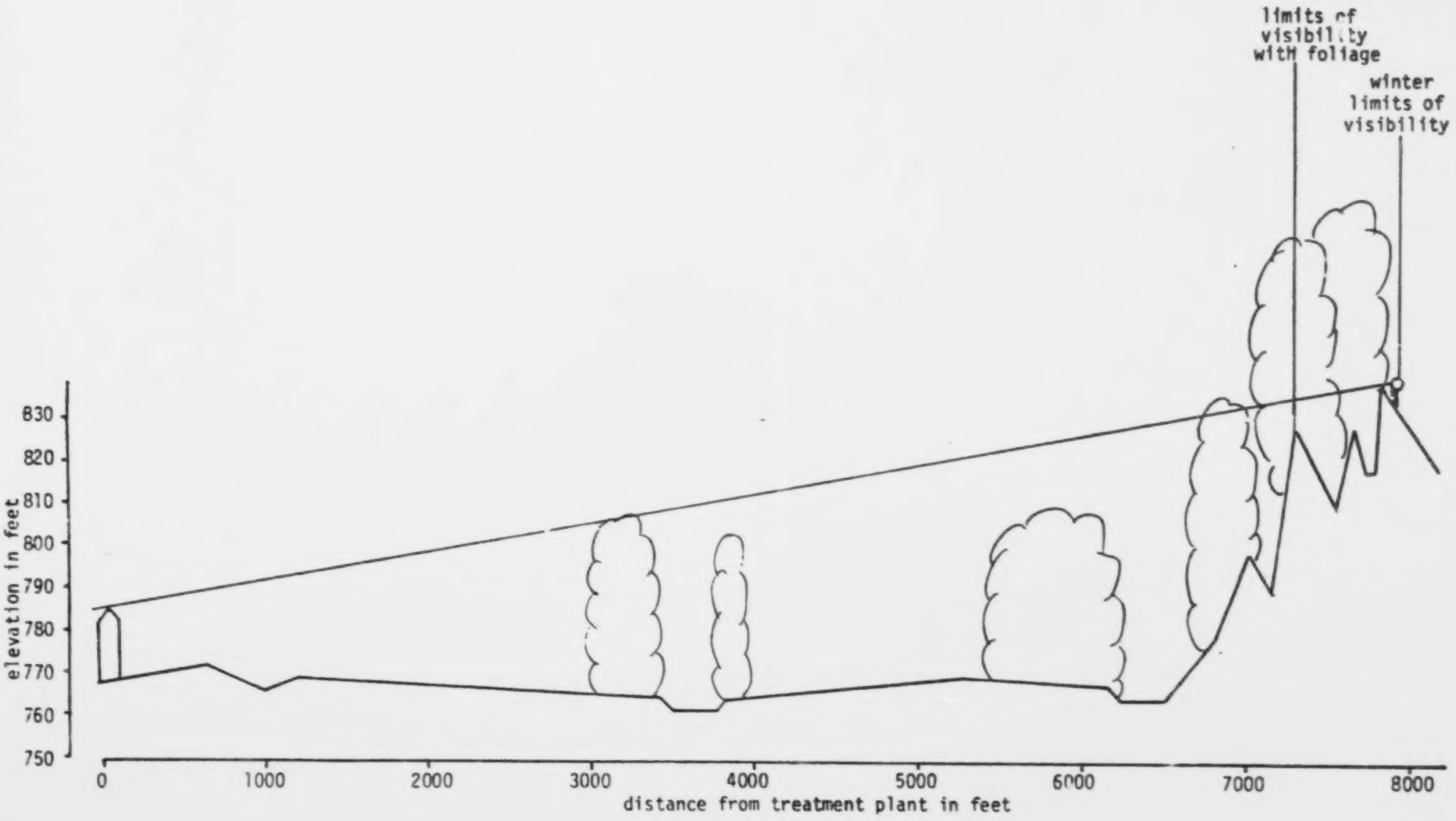
PROFILE 14

Source: Enviro Control, Inc., 1975



PROFILE 15

Source: Enviro Control, Inc.



PROFILE 16

Source: Enviro Control, Inc., 1975

Appendix J
Selected Correspondence

THE OHIO STATE UNIVERSITY

ENVIRONMENTAL PROTECTION AGENCY
RECEIVED
APR 17 1975
PLANNING BRANCH - Region V
FILE NO. ________

14 April 1975

U.S. Environmental Protection Agency
Region V
230 South Dearborn St.
Chicago, Illinois 60604

Gentlemen:

Enclosed is a copy of a report on the naiad mollusks of the Olentangy River in the immediate vicinity of the proposed sewage treatment plant opposite the Highbanks Metropolitan Park in southern Delaware County, Ohio. This report was recently prepared by me at the request of the Delaware County Commissioners.

I am firmly convinced that if the full effect of the proposed facility on the mollusk fauna of the Olentangy River is to be accurately predicted, then the full extent of the fauna in the area from the proposed sewage outfall to the mouth of the river must be studied. Limitations of time and funds have thus far prevented such an extensive survey.

We would be interesting in cooperating with the USEPA in conducting such a survey as part of the preparation of the environmental impact statement for this project. We believe that such a study is essential to determine the present status of the populations of endangered molluscan species known from this river.

I would appreciate receiving any available documentation and discussion of the alternatives for water quality management considered in the facilities plan.

Sincerely,

Carol B. Stein

Carol B. Stein, Ph.D.
Curator of Gastropod Mollusks

Dr. Carol B. Stein
Curator of Gastropod Mollusks
Museum of Zoology
The Ohio State University
2578 Kenny Road
Columbus, Ohio 43210

THE NAIADES (PHYLUM MOLLUSCA, FAMILY UNIONIDAE) OF THE OLENTANGY RIVER BETWEEN POWELL ROAD AND I-270, DELAWARE AND FRANKLIN COUNTIES, OHIO

by

Carol B. Stein, Ph.D.
The Ohio State University Museum of Zoology
Columbus, Ohio
January 1975

INTRODUCTION: The freshwater bivalve mollusks of the Family Unionidae, commonly known as naiades, comprise a substantial portion of the biota of the aquatic ecosystems of natural, free-flowing streams such as the Olentangy River. These animals are major components of the food web of the natural community. They filter algae and other suspended matter from the water and convert it to animal tissue, which in turn serves as food for fishes, raccoons, and other carnivores. Ohio's prehistoric Indians and early white settlers ate the naiades from clean, unpolluted rivers. Early farmers drove their hogs to market along the rivers, keeping the animals fat by allowing them to root out and eat the naiades in the shallow riffles along the way.

The shells of these animals have been utilized by man in many ways. Shell hoes and eating utensils as well as decorative shell and pearl jewelry were made by the earliest occupants of Ohio. Mother-of-pearl buttons made from naiad shells formed the basis of a major industry in the midwest from the late 1800's until the end of World War II, when plastics and glass buttons could be produced more cheaply. In recent years, the shells of certain species have been much in demand by the Japanese cultured pearl industry, which uses beads of American naiad shell as the nuclei around which the cultured pearl layer is secreted. Many thousands of dollars worth of such shells have been shipped from Ohio to Japan for this purpose within the past few years. The novelty industry also uses various shells as raw material for everything from souvenir ashtrays to jewelry to imbedded plastic countertops.

Researchers have discovered that naiades can be used as living monitors of environmental conditions, as they live for many years and secrete shell layers each year. The composition of the various shell layers can be used to trace the past history of various contaminents, such as heavy metals. The bodies of naiades also concentrate certain chemicals, such as pesticides, allowing scientists to detect the presence of very low levels of these chemicals in the streams. Additional research is now being conducted to determine how these living recorders can best be "decoded."

Students of biology have learned much about the evolution and geographic patterns of animal life by studying naiades. Some investigators are studying various bivalve mollusks since certain chemicals present in their tissues appear to have value in curing cancer. The full potential value and significance of any species of naiad has never been fully explored. So long as the species survives and man's curiosity and inventiveness persist, new values and uses may be discovered for it.

A species which becomes extinct, however, is a lost resource. Its unique biochemical makeup, its genetic potential, its possibilities as a source of food, drug, or raw material for man's yet-unrecognized needs, are lost to future generations forever. It cannot be restocked in renovated habitats, because all seed stock is dead. Since no two species are alike, the potential opportunities offered by an endangered species cannot be duplicated by another species which may be able to survive. One species of naiad differs from another just as significantly as a porpoise differs from a whale.

Most naiad species are highly sensitive to various kinds of pollution and to other forms of environmental alteration. They have complex life cycles, and successful reproduction of each species is dependent upon the presence of its particular species of host fish or salamander at the critical stage of its larval development, when the bivalve's glochidium larva must attach itself to its particular host or perish.

Several naiad species which have been found in the Olentangy River are now considered by state and federal officials to be rare and/or endangered.

This study was undertaken at the request of the Delaware County Commissioners to determine what naiad species are now present in the Olentangy River from the Powell Road bridge, Delaware County, downstream to the I-270 bridge in Franklin County, Ohio.

PREVIOUS RECORDS OF OLENTANGY RIVER SYSTEM NAIADES: The earliest published records of naiades in the Olentangy drainage apparently are those in Sterki's 1907 "Preliminary Catalogue of the Land and Fresh-water Mollusca of Ohio." He reported Anodonta grandis salmonia Lea from the Olentangy River (locality not specified) and Anodontoides ferussacianus subcylindraceus Lea from the Olentangy River at Delaware. Both were collected by Bryant Walker.

Dr. Marla Ray Eggleston of Marietta College made a statewide survey of mollusks in the 1930's, and made collections on the Olentangy River north of Delaware and on Whetstone Creek west of Ashley.

In a master's thesis deposited at The Ohio State University in 1940, Mr. Afton E. Price recorded 25 species of naiades from Franklin County, including 11 species he found in the Olentangy River.

Mr. Kurt Boker of Kelleys Island, Ohio, has collected a number of Olentangy River shells, including a fine set of live-taken Quadrula cylindrica and two Cyclonaias tuberculata from Columbus.

Dr. David H. Stansbery, Director and Curator of Bivalves, The Ohio State University Museum of Zoology (OSUM), made many naiad collecting trips to the Olentangy River between 1956 and 1960 as part of his naiad research program. All of the specimens collected by him were deposited in the OSUM bivalve research collection.

In 1960 I began a research project on the naiad fauna of the Olentangy River system as a master's thesis. Collections were made at 45 sites on the main stream and its tributaries, and earlier records were summarized in the thesis, which was completed in 1963 (Stein, 1963a). All material collected during this project is also deposited at OSUM. Additional Olentangy River records have accumulated at OSUM since 1963 as a result of the efforts of museum staff and students.

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A paper based on the results of my thesis study was presented at the 1963 annual meeting of the American Malacological Union, and an abstract (Stein, 1963b) was published. Living specimens of 21 naiad species were collected in the Olentangy River between 1956 and 1962. These were:

Fusconaia flava (Rafinesque, 1820)	10, 11
Amblema plicata plicata (Say, 1817)	10, 11
•Quadrula cylindrica cylindrica (Say, 1817)	10, 11
Pleurobema coccineum (Conrad, 1836)	10, 11
[Then considered a form of Pleurobema cordatum (Rafinesque, 1820)]	
Elliptio dilatatus (Rafinesque, 1820)	10, 11
Uniomerus tetralasmus (Say, 1830)	
Lasmigona costata (Rafinesque, 1820)	10, 11
Anodonta grandis grandis Say, 1829	10, 11
Anodonta imbecillis Say, 1829	10
Anodontoides ferussacianus (Lea, 1834)	
Alasmidonta viridis (Rafinesque, 1820)	11
[Then known as Alasmidonta calceolus (Lea, 1829)]	
Alasmidonta marginata Say, 1818	10, 11
Strophitus undulatus undulatus (Say, 1817)	10, 11
Ptychobranchus fasciolaris (Rafinesque, 1820)	10, 11
Toxolasma parva (Barnes, 1823)	10
[The genus Toxolasma was formerly known as Carunculina]	
Villosa iris iris (Lea, 1829)	10, 11
Villosa fabalis (Lea, 1831)	10
Lampsilis radiata luteola (Lamarck, 1819)	10, 11
[Then known as Lampsilis radiata siliquoidea (Barnes, 1823)]	
Lampsilis ventricosa (Barnes, 1823)	10, 11
[Then considered a form of Lampsilis ovata (Say, 1817)]	
Lampsilis fasciola Rafinesque, 1820	10, 11
Epioblasma triquetra (Rafinesque, 1820)	10, 11
[The genus Epioblasma was then known as the genus Dysnomia]	

Five species listed in the 1963 study had been found only as dead shells, but were apparently maintaining low-level populations in the river at that time:

Cyclonaias tuberculata (Rafinesque, 1820)	10
•Pleurobema clava (Lamarck, 1819)	10, 11
Lasmigona compressa (Lea, 1829)	11
•Simpsonaias ambigua (Say, 1825)	10
[The genus Simpsonaias was formerly known as Simpsoniconcha]	
Obovaria subrotunda (Rafinesque, 1820)	10

The remaining three species, found only as subfossil shells, were believed to have been extirpated from the Olentangy River system prior to 1963:

Elliptio crassidens crassidens (Lamarck, 1819)
Actinonaias ligamentina carinata (Barnes, 1823)
[Formerly known as Actinonaias carinata (Barnes, 1823)]
•Epioblasma torulosa rangiana (Lea, 1833)

The species marked with an asterisk (*) above are included in the Ohio Division of Wildlife's current list of Ohio's Endangered Wild Animals.

Of the 45 collecting sites sampled in my 1963 study, two were located at the ends of the stretch of river now under consideration. Station 10, located between Wilson Bridge Road and Snouffer Road in Sharon Township, Franklin County, lay at the downstream end of the stretch. Station 11, at the State Route 750 (Powell Road) bridge, marks the upstream end of the area now under consideration. The naiad species reported from these sites in 1963 are indicated above by a (10) or (11), respectively. No samples were taken from the stretch of river between these two locations for the 1963 study.

All field collection data records for Olentangy River bivalve mollusks in the Ohio State University Museum of Zoology from 1963 to the present have been examined. Of the 39 collections from the river during this period, only one was made in the designated study area prior to the initiation of this project. This collection, made August 7, 1972, by Miss Peggy Lou Smith, Mr. Ralph W. Hennen, and me, consisted of a single shell of Alasmidonta marginata (OSUM-33150) taken at Highbanks Metropolitan Park just upstream from the mouth of Flint Ravine. The following species were seen there at the time but were not collected:

Anodonta grandis grandis	Ptychobranchus fasciolaris
Lasmigona costata	Lampsilis radiata luteola
Strophitus undulatus undulatus	Lampsilis ventricosa

Since the primary purpose of this field trip was to gather general natural history data concerning the suitability of this area as a National Natural Landmark, no effort was made to thoroughly inventory the species of naiades present.

STUDY METHODS: On 1 November, 1974, I visited the downstream end of the study area for approximately three hours, during which time I examined the river from the Wilson Bridge Road and I-270 bridges upstream approximately 1/4 mile. On November 2, Mrs. Karen Jennings Reese, Miss Lisa Roberts, and I intensively searched the Olentangy River from the Powell Road bridge downstream approximately 1/10 mile for about six hours.

Collecting conditions for both of these trips were very good despite the late season, for the weather was fairly warm and partly cloudy, and the Corps of Engineers kept the river at its minimum flow rate, so the water was low and clear. These conditions made it possible to search the river bottom and to obtain living specimens of several species.

Heavy rains in the river basin on November 4 raised the water level and greatly increased the river's turbidity, making it virtually impossible to locate living naiades in collections made later that week.

On November 5 I worked along the river from the Mount Air sewage disposal plant upstream approximately 7/10 mile. A good collection of dead shells which had been washed up on islands and gravel bars was made in about three hours.

Mr. John Veverka and I made an all-day canoe collecting trip down the entire study stretch from Powell Road to Wilson Bridge Road and I-270 on 9 November. Material from this trip was divided into three separate collections: (1) Powell Road to the Orange/Liberty Township line; (2) Liberty Township, immediately above the High Banks area; and (3) the High Banks area upstream from Mount Air. No collecting was done at Mt. Air or below it on this trip.

At least one specimen of every species we saw was collected and brought back to the museum for study. All specimens were identified by me and were verified by Dr. David H. Stansbery. Voucher specimens of all species collected have been deposited in The Ohio State University Museum of Zoology bivalve research collection, where they are available for further study.

NAIAD SPECIES COLLECTED IN THE STUDY AREA:

Anodonta imbecillis Say, 1829

Two dead shells of this species were taken between Powell Road and the Orange/Liberty Township line in the upper portion of the study area. This is a widespread species throughout Ohio, though it is not generally found in large numbers. There evidently is a living population in the study area.

Anodonta grandis grandis Say, 1829

This is one of the most common naiades of the Olentangy River system, and is widespread throughout the state. Two living specimens were taken in the channelized portion of the Olentangy at the I-270 bridge, and four were found alive below the Powell Road bridge. Dead shells were taken throughout the study area. This species, like Anodonta imbecillis, evidently is one of the few naiades which is able to survive and reproduce in some impounded and channelized rivers. It was one of the first species to become re-established below Fifth Avenue Dam in Columbus after highway construction there (Stein, 1972). Its thin shell has no commercial value.

Anodontoides ferussacianus (Lea, 1834)

This characteristic species of small streams is not ordinarily found in rivers as large as the Olentangy at Highbanks. However, one dead shell was taken below Powell Road during this study. This is apparently the farthest downstream museum record for the species in the Olentangy drainage. There may be a resident breeding population of this species in the study area, but it seems more likely that the specimen represents a stray glochidium carried down from the headwaters by a migrating host fish.

Strophitus undulatus undulatus (Say, 1817)

This common and widespread Olentangy drainage mollusk was found throughout the study area. Two living specimens were taken below the Powell Road bridge. There is evidently a healthy population of S. undulatus here, as in other small rivers across the state.

Alasmidonta marginata Say, 1818

A species of swift, well-aerated water and coarse substrate, the A. marginata is maintaining a thriving population in this stretch of the Olentangy. Thirteen living specimens were collected below Powell Road, and fresh dead shells were common throughout the study area. This species is becoming scarce throughout its range as many streams in which it once lived are becoming unsuitable habitat because of manmade physical and chemical modifications. If present trends continue, this species may be expected to appear on endangered species lists within a few years.

Lasmigona costata (Rafinesque, 1820)

Although no living specimens of this species were taken during the present study, dead shells were fairly common and there is evidently a reporducing population in the area. This is one of the common species of the Olentangy drainage and is found in similar rivers throughout the state.

Quadrula cylindrica cylindrica (Say, 1817)

One dead shell of this rare species was collected below Powell Road during the current study. It was also found at this site in 1960 and below Wilson Bridge Road in 1959, 1960, and 1962. There may still be a relict population of this once widespread species in the lower Olentangy River. However, no living specimens are known to have been found in this river since 1961. The only known breeding population of this species remaining in Ohio today appears to be in the Mohican-Walhonding River system, where it is threatened by intermittent impoundment. The scattered records of this species from the Olentangy River, Big Walnut Creek, and Big Darby Creek probably indicate populations which are almost extirpated. The Cob Shell is included by the Ohio Division of Wildlife in its official listing of Ohio's Endangered Wild Animals.

Amblema plicata plicata (Say, 1817)

Living Amblema plicata were collected below Powell Road and at Highbanks during this survey. Dead shells were found throughout the study area. This is a common species, rather widely distributed in rivers across the state. Its thick shells are used in the cultured pearl industry, and in recent years this species has been commercially harvested in the lower Muskingum River and in parts of the Ohio River.

Fusconaia flava (Rafinesque, 1820)

Several dead shells of Fusconaia flava were found from Powell Road downstream to Mount Air. No living specimens were taken, but a small population of this species is probably living in the study area. This is a common species characteristic of swift current in small rivers throughout the state.

Cyclonaias tuberculata (Rafinesque, 1820)

A single subfossil fragment of this species was found above the I-270 bridge. This is the eighth specimen of this species known from the Olentangy River. Two specimens reported during my earlier survey (Stein, 1963a) were fresh dead shells, 30 to 40 years of age at the time of their death. All other recent specimens collected have been subfossil specimens. It is possible that there may yet be a few individuals of this species surviving in the Olentangy, but we have no evidence of a large breeding population in the system. A few living specimens have been collected in the upper Scioto River and in lower Big Darby Creek in recent years. This species is frequently found in medium-sized rivers.

Pleurobema coccineum (Conrad, 1836)

Several dead shells of this species were found throughout the study area. There evidently is a living population within this stretch of the Olentangy River. The P. coccineum is found in rivers of medium size in both the Lake Erie and Ohio River drainages in Ohio.

Elliptio dilatatus (Rafinesque, 1820)

Two living specimens were taken below the Powell Road bridge, and dead shells were found throughout the study area. It is one of the most common bivalves in Ohio, and has been found in nearly every unpolluted, undredged, medium-sized free-flowing stream in the state.

Ptychobranchus fasciolaris (Rafinesque, 1820)

Living specimens of this species were taken at the Highbanks and below the Powell Road bridge. Dead shells were common throughout the study area. This is a characteristic species of the riffles and runs of medium-sized unpolluted streams in Ohio.

Villosa fabalis (Lea, 1831)

One subfossil fragment found at Highbanks has been tentatively identified as this species. No fresh dead or living specimens were found in the 1974 survey, though a dead shell had been taken below the Wilson Bridge Road bridge in the 1963 study. This species has become quite rare in Ohio in recent years. The Ohio State University Museum of Zoology collection includes live-collected shells from the Olentangy River above Delaware, the Walhonding River, Big Darby Creek, and Lake Erie. If present trends of habitat modification continue, V. fabalis will probably be added to the state endangered species list within a few years.

Villosa i. iris (Lea, 1829)

As in the 1963 study, this naiad was found to occur throughout the area studied, but it was not found in abundance. Several dead shells were collected.

but no living specimens were found. There is evidently a living population present, though the individuals are not numerous. Even in the earlier study, only one living specimen was taken. This species is widely scattered across the state and is not yet considered to be endangered.

Lampsilis radiata luteola (Lamarck, 1819)

The most abundant and widely distributed naiad in the Olentangy River system, this species was found throughout the study area. Living specimens were taken below Powell Road bridge, and empty shells were common on gravel bars and islands where they had washed up during floods. This species evidently has wide ecological tolerances and is one of the last to disappear from polluted streams. It is one of very few species in its subfamily (Lampsilinae) which survives in some impounded rivers. It occurs in nearly every stream in Ohio which supports naiad life of any kind.

Lampsilis ventricosa (Barnes, 1823)

Lampsilis ventricosa was found living below Powell Road, and dead shells were taken throughout the study area. This is a common species in the small and medium-sized rivers of Ohio. In the 1963 study, *L. ventricosa* and *Lasmigona costata* were the only two species found within four miles below the Delaware sewage plant outfall.

Lampsilis fasciola Rafinesque, 1820

This species was found living below Powell Road, and dead shells of it were taken throughout the study area. It is a characteristic species of gravel riffles and runs in swift current in many of Ohio's small rivers, but is not usually found in large numbers. It is not now considered to be endangered.

Epioblasma triquetra (Rafinesque, 1820)

At the time of the 1963 study, the *E. triquetra* was a fairly common naiad in the lower Olentangy River, especially below the Fifth Avenue Dam. In recent years, however, it seems to have become quite scarce. Further study is needed to determine whether it still lives in the Columbus stretch of the river. Three dead shells were taken in this survey, so it appears that there is still a population in the study area. This species, like *Villosa fabalis*, has become quite rare in Ohio in recent years. If present trends continue, it will very likely appear on the endangered species list within a few years.

Epioblasma torulosa rangiana (Rafinesque, 1820)

Two subfossil specimens of this rare species were found during the present study. Only four had been taken from the system previously, and those had all been found in Columbus. It is possible that a few individuals may yet survive

in the lower Olentangy River, but I suspect it has been extirpated from the system. There is still a breeding population in Big Darby Creek, and one is believed to have existed in the St. Joseph River in northwestern Ohio until recently. This species is included in the Ohio Division of Wildlife's official list of the state's endangered wild animals.

In a letter to Ohio's former Director of Natural Resources William B. Nye, Dr. Ronald O. Skoog, Acting Chief of the U. S. Department of Interior's Office of Endangered Species, states that this species "is a candidate for the Department of the Interior's official list of species that are threatened with becoming endangered. International concern has been expressed over the plight of this species. It appears in Appendix 2 of the Convention on International Trade in Endangered Species of Wild Flora and Fauna...which was signed on March 3, 1973, ratified by the U. S. Senate, and implemented in the Endangered Species Act of 1973."

Corbicula sp.

This small round-shelled bivalve is not a naiad, but a true clam. It is one of the most numerous bivalve species in the study area today. It was introduced from Asia into California where it became a problem in irrigation ditches. It was first noticed in the Mississippi River basin in the summer of 1957, when it caused difficulties by clogging up small cooling water pipes at the Shawnee Steam Plant on the Ohio River at Paducah, Kentucky. It was not found in the Olentangy River until 1 January 1972, when Dr. Milton B. Trautman found two dead shells on the shore of the Delaware Reservoir. Since then, it has spread rapidly and is now one of the most abundant bivalves of the lower Olentangy River. Living specimens and dead shells were found throughout the study area. Since this clam has a planktonic larva and is not dependent upon the presence of a suitable fish or amphibian host in order to complete its life cycle, it can spread to bodies of water where the native naiads cannot become established.

OTHER SPECIES WHICH MAY BE PRESENT IN THE STUDY AREA:

Pleurobema clava (Lamarck, 1819)

This rare species is on the official list of Ohio's Endangered Wild Animals. The Olentangy River is one of very few rivers inthe state from which this species has been collected within the past fifteen years. In 1960 and 1961 two rather fresh dead shells were found at Worthington. Twelve subfossil specimens which had been collected between the Delaware Dam and the Dodrige Street bridge in Columbus were reported in the 1963 survey. A single subfossil specimen was taken above the Delaware Dam at Claridon. It is possible that this species is still living in the study area or in the Olentangy River downstream from it. If there is a population at Worthington, as indicated by the two fresh dead shells, it could be affected by the effluent of the proposed sewage treatment facility upstream.

Elliptio crassidens (Lamarck, 1819)

One subfossil specimen of this species was collected from the Olentangy River in Columbus in 1959. No other specimens are known from the Olentangy system, although a few living specimens have been collected in recent years from the Big Darby Creek and Big Walnut Creek. These individuals probably represent glochidia dropped by fish moving upstream from the Ohio River, where there is a known breeding population. This species is characteristic of large rivers and is rarely encountered in streams as small as the Olentangy.

Uniomerus tetralasmus (Say, 1830)

This species is very rare in Ohio, and is known in the state only from a few disjunct populations, one of which still persists below the King Avenue bridge in Columbus. It is not known to occur in the Olentangy River upstream from this site. This population could be affected by a change in water quality caused by new upstream effluents.

Lasmigona compressa (Lea, 1829)

One fresh dead shell of this species was collected at the Powell Road bridge in 1960. It is one of only four specimens known from the Olentangy River system. This is an uncommon species in Ohio, but a few individuals have been found in several small rivers.

Simpsonaias ambigua (Say, 1825)

This rare shell, which is on the Ohio list of Endangered Wild Animals, was represented in the 1963 survey by two shells. One of these was found just below the study area, south of Wilson Bridge Road in 1962. The other was taken just north of Delaware in 1960. It is quite likely that there are living specimens of this species in the study area. This is the only Ohio naiad known to be parasitic during its larval stage on a salamander rather than a fish host. The mudpuppy, Necturus maculosus (Rafinesque, 1818), serves as host for this mollusk, and reportedly the life cycle is completed under large flat rocks in fast flowing rivers, the habitat of both species.

Alasmidonta viridis (Rafinesque, 1820)

One specimen of this species was taken at the Powell Road bridge in 1960. It is typically a species of small streams and tributaries, and rarely is found in rivers as large as the Olentangy River in the study area. However, there may be a few living individuals present within the study area and below it.

Obovaria subrotunda (Rafinesque, 1820)

Dead shells of this species were found downstream from the present study area during the 1963 survey, but no living ones are known to have been taken in the river since 1940. A few individuals may yet survive in the river. This species is becoming less common in Ohio as its former habitats are being modified by pollution, impoundment, and other alterations.

Actinonaias ligamentina carinata (Barnes, 1823)

This species once lived in the Olentangy, as evidenced by four subfossil shells found in Columbus in 1959 and 1960. However, it has evidently been extirpated from the entire upper Scioto River system. No living or fresh dead specimens are known to have been collected anywhere in the Scioto River drainage within the past century, though living specimens are common in the Sandusky River and in the Muskingum River systems.

Toxolasma parva (Barnes, 1823)

The range of this species in the Olentangy system is mostly downstream from the study area. None were found in northern Franklin County or southern Delaware County in the 1963 survey, though there are three scattered records above Delaware. Eight specimens were collected in Shaw Creek, Morrow County.

SUMMARY: Living specimens of nine species of naiades were collected in the study area during this survey. Eleven additional species were represented by dead shells collected in November, 1974, in the study area. Two of these, Quadrula cylindrica and Epioblasma torulosa rangiana, are on the official list of Ohio's Endangered Wild Animals.

Dead shells of two additional species on the state Endangered Wild Animals list, Pleurobema clava and Simpsonaias ambigua, were taken just below the study area in northern Franklin County in the early 1960's. There is also a record of Pleurobema clava for Powell Road bridge.

A table showing the numbers of each species collected, whether the specimens were alive or dead when collected, and the section of the study area where the specimens were found is attached.

As noted under Study Methods above, only two sites were collected under reasonably good conditions for obtaining living specimens. These were just below the Powell Road bridge and just above the I-270 bridge. Under conditions of low, clear water in warm weather it is entirely probably that living specimens of most of the species reported only as dead shells could have been found in the study area. Perhaps some of the species found in the early 1960's but not in 1974 could also have been found.

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NAIAD SPECIES COLLECTED IN THE OLENTANGY RIVER, HIGHBANKS STUDY AREA, IN NOVEMBER 1974

SPECIES	RIVER SECTION (FROM POWELL ROAD BRIDGE TO THE I-270 BRIDGE)					
	Below Powell Rd. (CDS:1974:75)	Powell Rd. down-stream to Orange/ Liberty Twp. line (CDS:1974:77)	Just above the High Banks (CDS:1974:78)	At the High Banks above Mount Air (CDS:1974:79)	At Mount Air, above sewage plant (CDS:1974: [illegible])	Above I-270 and Wilson Bridges, below Mt. Air sewage tr. plant (CDS:1974:[illegible])
Anodonta imbecillis	0	2 dead	0	0	0	0
Anodonta grandis	4 live	4 dead	3 dead	2 dead	6 dead	2 live
Anodontoides ferussacianus	0	1 dead	0	0	0	0
Strophitus undulatus	2 live	5 dead	3 dead	4 dead	4 dead	2 dead
Alasmidonta marginata	13 live	10 dead	13 dead	6 dead	15 dead	1 dead
Lasmigona costata	4 dead	2 dead	10 dead	0	6 dead	7 dead
Quadrula cylindrica	1 dead	0	0	0	0	0
Amblema plicata	1 live	2 dead	3 dead	1 live	3 dead	1 dead
Fusconaia flava	3 dead	4 dead	1 dead	3 dead	0	0
Cyclonaias tuberculata	0	0	0	0	0	1 dead
Pleurobema coccineum	3 dead	5 dead	6 dead	8 dead	0	7 dead
Elliptio dilatatus	2 live	7 dead	10 dead	6 dead	6 dead	1 dead
Ptychobranchus fasciolaris	6 live	6 dead	17 dead	1 live	15 dead	1 dead
Villosa fabalis	0	0	0	(1 ?)	0	0
Villosa iris	1 dead	2 dead	1 dead	2 dead	3 dead	0
Lampsilis radiata luteola	9 live	12 dead	22 dead	17 dead	26 dead	1 dead
Lampsilis ventricosa	8 live	3 dead	9 dead	2 dead	6 dead	7 dead
Lampsilis fasciola	1 live	3 dead	9 dead	6 dead	5 dead	1 dead
Epioblasma triquetra	1 dead	0	0	2 dead	0	0
Epioblasma torulosa rangiana	0	1 dead	0	1 dead	0	0
Corbicula (introduced; not a true naiad)	19 live	16 dead	2 live	1 live	8 dead	3 live

THE OHIO STATE UNIVERSITY

June 9, 1975

ENVIRONMENTAL PROTECTION AGENCY
RECEIVED
[illegible]
PLANNING BRANCH - Region V
FILE NO.________

Mr. Kent Fuller
U. S. Environmental Protection Agency
Region 5
Planning Branch
230 South Dearborn
Chicago, Illinois 60604

Dear Mr. Fuller:

I have prepared a written statement for the public hearing concerning the preparation of an Environmental Impact Statement on the proposed South Central Delaware County, Ohio sewage treatment project. It will not be possible for me to attend the public hearing since I will no longer be a resident of Columbus.

My interest in submitting this statement stems from my intimate association with research carried on by myself, colleagues and my students on this stream and secondly because I am at present a property owner with frontage directly on the Olentangy River. I reside at 3539 Olentangy Boulevard, Clinton Township, Franklin County, Columbus, Ohio.

I believe the Olentangy constitutes an important, yet at time, little appreciated, recreational resources for all the urban residents of Central Ohio, particularly those of the inner city and I hope this statement will be given full consideration in preparation of the proposed Environmental Impact Statement.

Sincerely,

Walter T. Momot
Walter T. Momot
Associate Professor

WTM:mee

Walter T. Momot

Statement on the proposed sewage treatment plant for southern Delaware County and its effects on the recreational resources of the Olentangy River.

Usually the siting of a sewage treatment plant on a stream results in the enhancement of the water quality of the stream since the untreated water borne waste of the watershed is collected, treated and the resulting effluent released and diluted by the receiving stream. However, the Southern Delaware plant, as proposed, may in fact contribute to a substantial deterioration of the water quality of the Olentangy rather than its improvement.

One reason is that this plant will collect and concentrate the waste from three other watersheds as well as the Olentangy and place the effluent into this single stream at a single point. It is interesting to note that the other watersheds were not selected as a site for effluent disposal because they constitute a public water supply. Apparently the designers of the plant felt the effluent will deteriorate the water for one human use but chose to ignore other human needs such as public recreation in an urban environment that is becoming more crowded every day.

The initial rated capacity of the Southern Delaware Sewage Treatment Plant is for 1.2 million gallons per day (MGD) with a 3.4 MGD peak flow capacity. Future expansion is planned for an effluent discharge of 6.0 MGD with a 9.6 MGD peak flow.

The Olentangy River near Worthington has an average flow of 277 MGD and a minimum low flow of 14.2 MGD was recorded. Furthermore, the median flow is only 66.6 MGD[1]. The Olentangy is characterized by the Division of Water, Ohio Department of Natural Resources as having "poor natural low flow characteristics".[1]

I believe the low flow characteristics of the river will prove insufficient to dilute toxic wastes resulting from the discharge of the effluent of the plant.

As an example, consider that the discharge of chlorine in the effluent will be 0.50 ppm. Table 1 gives a summary of the results of exposing fish to residual chlorine. All of these species are found in the Olentangy.

Table 1. Summary of Results of Brief Exposures of Fish to Residual Chlorine[2]

Fish Species	Effective Endpoint	Time	Measured Chlorine in ppm.
Smallmouth Bass	Median mortality	15 hr.	0.50
White Sucker	Lethal	30-60 min.	1.00
Largemouth Bass	50% die	1 hr.	>0.74
Largemouth Bass	50% die	12 hr.	0.365
Fathead Minnow	50% die	1 hr.	0.79
Fathead Minnow	50% die	12 hr.	0.26

The same publication[2] indicates that many fish food organisms are even less tolerant. The publication concluded that the EPA guideline for streams receiving wastes treated continuously with chlorine should have a residual chlorine content not exceeding 0.002 ppm. for the protection of most aquatic organisms.

To dilute 1.2 MGD discharge, the minimum river discharge must be be 309 ft^3/sec. According to the USGS gauge at Worthington, Ohio, this flow was exceeded only 87 days during the recreational season (April - October, 1972) and on 71 days in 1973.

For a discharge of 9.7 MGD, a flow of 2475.5 ft^3/sec. would be necessary to meet the EPA guideline for chlorine. This was exceeded in only 18 days during all of 1972-73 and only 17 days during 1971-72. What would happen during a drought year can only be guessed but the record low flow of the Olentangy was 3.2 ft^3/sec. on June 27, 1953 and this was after river flow had been supposedly regulated by Delaware Dam.

I thus believe the dilution capacity of the Olentangy River is not sufficient to handle the toxic concentration of various chemicals which will be found in the effluent. At present the Olentangy meets "A" water quality standards for aquatic life with an average oxygen content of 6.2 ppm. at 21° C and a pH range of 6.0 - 8.5.[2] It seems folly to degrade a good quality stream in the name of environmental protection.

I believe these concentrations will prove extremely detrimental to the aquatic life of the river as well as the aesthetic appeal of the stream upon which the recreational resource is based.

It is my contention that the Olentangy is a major urban recreational resource for the citizens of central Ohio. The fish population of the Olentangy river is much utilized by the citizens of central Ohio, Table 2 and 3, and contains a high quality fishery comparable with any other warm water stream in the U. S. (Tables 4, 5, 6.)

I contend that the toxic effluent of the proposed treatment plant will have a significant detrimental effect on this fishery.

The sport fishery of the Olentangy is comprised of 12 major species (Table 2) out of a total fauna of 61 species which have been collected from the Olentangy. Included in the total are the Spotted Darter, Etheostoma maculatum, which is on the list of rare and endangered species for Ohio and the bluebreasted darter, Etheostoma camurum, a rare fish known from only a very few localities in Ohio. Both species occur at sites below the proposed treatment plant. Several rare and endangered molluscs also occur in the Olentangy below these sites.

Angler use of the river below the proposed site is substantial varying between 3,400 and 11,400 angler hours from June to October with a catch of 2,000 and 4,000 fish (Table 3) of which a very substantial proportion are game fish (Table 5). Table 4 gives an idea of populations of these fish in the river using electrofishing gear. The most common game species in the river are Smallmouth Bass, Rockbass and Sunfish.

Table 5 gives the gamefish catch per hour of anglers surveyed downstream of the proposed site.

Table 2. Total number species including list of food and game fish collected from the Olentangy River from Powell Road south.

Name of Game and Food Fish	COLLECTION SITE I. Dodridge to King Ave., Franklin Co., Clinton Twp.	II. Whetstone to Northmoor Park, Franklin Co., Clinton Twp.	III. Riffles at I-270, Franklin Co., Clinton Twp.	IV. Area just North of Riffles and South of Powell Rd., Delaware Co., Orange Twp.
Smallmouth Bass	x	x	x	x
Largemouth Bass	x	x	x	x
Channel Catfish	x	x	x	x
White Crappie	x	x	x	x
Black Crappie	x	x	x	x
Bluegill	x	x	x	x
Pumpkinseed Sunfish	x	x		
Green Sunfish	x	x	x	x
Black Bullhead	x	x		
Brown Bullhead	x	x		
Rock Bass	x	x	x	x
Yellow Bullhead	x	x	x	x
White Bass	x	x	x	
Walleye				x
Carp	x	x	x	x
Muskellunge			x	
TOTAL GAME AND FOOD FISH	14	14	12	11
TOTAL SPECIES RECORDED FOR AREA	61	40	27	35
TOTAL NUMBER KNOWN FROM TOTAL STREAM AREA SOUTH OF POWELL ROAD	61			

TOTAL KNOWN FROM WATERSHED 61*

*Included are Etheostoma maculatum, which is on the list of rare and endangered species for Ohio and Etheostoma camurum, a rare fish known from only a very few localities in Ohio. Both species were collected at sites below the proposed treatment plant.

Table 3. Estimated Angler Use of the Olentangy River below the Proposed Site of the Southern Delaware Sewage Treatment Plant.[4,5]

Year	Wilson Bridge Road to mouth of Stream		Proposed STP Site To Wilson Bridge Road	
	Number Angler Hours	Number Fish Caught	Number Angler Hours	Number Fish Caught
1972	10,106	3,988	532	440
1973	7,430	1,264	992	1,376
1974	2,024 •	1,172	1,336	952

• Construction on St. Rt. 315 at Henderson Road severely limited angler use of the River during 1974.

Table 4. Catch per minute[4] of game and food fish at three sites on the Olentangy River by electrofishing in 1974.

Species	Powell Road M., Ju., Jl., A., N.	I-270 M., Ju., Jl., A., N.	Henderson Road M., Ju., Jl., A., N.
Smallmouth Bass	0.258, 0.323, 0.125, 0.188, 1.087	0.590, 0.407, 0.358, 0.448, 1.827	0.072, 0.026, 0.045, 0.030, 0.175
Largemouth Bass	-----, -----, -----, -----, 0.087	-----, -----, -----, 0.029, 0.220	-----, -----, -----, 0.022, 0.058
Channel Catfish	0.008, 0.004, 0.006, 0.008, 0.016	0.005, 0.002, 0.008, -----, 0.054	0.009, -----, 0.015, -----, 0.008
White Crappie	0.071, 0.117, 0.046, 0.122, 0.222	0.052, 0.022, 0.040, 0.016 0.077	0.198, 0.079, 0.065, 0.038, 0.150
Black Crappie	0.008, -----, 0.052, 0.155, 0.357	0.040, 0.014, 0.074, 0.033, 0.143	0.540, 0.005, 0.060, 0.032, 0.050
Bluegill	0.071, 0.058, 0.185, 0.285, 0.349	0.070, 0.136, 0.171, 0.178, 0.345	0.036, 0.031, 0.100, 0.033, 0.100
Rockbass	0.160, 0.377, 0.754, 0.557, 1.333	0.192, 0.287, 0.200, 0.107, 0.607	0.027, 0.005, 0.030, 0.015, 0.033
Various Sunfish	0.749, 0.598, 0.736, 0.687, 0.984	0.824, 1.290, 0.459, 0.613, 2.573	0.288, 0.260, 0.390, 0.213, 0.489
Bullheads	0.025, 0.024, 0.013, 0.040, 0.063	0.052, 0.008, 0.040, 0.041, 0.095	0.387, 0.026, 0.020, 0.022, 0.126
Walleye	-----, 0.009, -----, -----, 0.008	-----, 0.005, -----, -----, -----	-----, 0.005, -----, -----, -----
Muskellunge	-----, -----, -----, -----, -----	0.005, -----, -----, -----, 0.006	-----, -----, -----, -----, -----
Carp	0.321, 0.225, 0.569, 0.045, 0.341	0.374, 0.152, 0.189, 0.170, 0.270	0.774, 0.579, 0.300, 0.137, 0.317

M = May
Ju = June
Jl = July
A = August
N = November

Table 5. The catch per hour from June 3 to September 24 of game species in the Olentangy River during 1974 downstream of Powell Road at three sites in the vicinity of Powell Road, I-270 and Henderson Road.

Species	All	Rockbass	Sunfish	Smallmouth Bass	Catfish	Others*
catch/ hour	0.392	0.133	0.113	0.101	0.23	0.023

* Others included: White Bass, Crappie, Carp, Suckers.

Total fish caught 1080, Total hours fished 2,754.

The Olentangy Fishery compares favorably with other stream fisheries in the Eastern U. S. as shown in Table 6.

Table 6. Overall Catch rate of Smallmouth Bass in the Olentangy compared to other smallmouth streams (From a thesis by Edward Perry)[5] Multiple years are given by more than one estimate.

Locale	Overall Catch Per Hour	Smallmouth Bass Alone
Olentangy River	0.78, 1.39	0.22, 0.41
Massie Creek, Ohio	0.20	0.04
Little Miami Creek, Ohio	0.50	0.04
Potomac River Basin, Maryland	0.36	0.51, 0.37
Cacopon River, West Virginia	1.38	0.57
Shenandoah, Virginia	0.66, 0.79	0.46, 0.52
Riley Creek, Ohio	0.96	0.04
South Branch, Potomac	0.67, 1.14, 0.57	0.29, 0.71, 0.39

The catch rate per hour of smallmouth bass in the Olentangy is as good as that of other major warmwater streams in the eastern United States.

The Olentangy River constitutes a major quality sport fishery resource for the urban citizens of a rapidly growing area. Many other recreational uses of the stream are predicated on it's remaining a quality stream. Since it is the only remaining greenbelt in the immediate Delaware and northern Franklin County area it is a valuable resource of open space. The location of metropolitan and city parks both established and proposed attests to this value[3]. In addition large blocks of land, such as owned by Ohio State University, Union Cemetary and Chemical Abstracts, retain their aesthetic appeal for users of the stream providing a natural greenbelt area sorely needed particularly by inner city residents.

There are many sites particularly between the West Bank of the River and State Route 315 which could be developed for picnicking, camping, fishing and access for canoeing or hiking [3]. Already a scenic bikeway exists along a significant portion of the river.

The citizens of Ohio have already invested a enormous sum of time, energy and funds to ensure that the stream retains its aesthetic and recreational value for future generations. It would be a tragic folly to despoil this for the convenience of a few real estate developers in the name of "environmental enhancement," and progress. How can we permit the destruction of a significant urban resource upon which the hope of so many future generations of central Ohio citizens are predicated for such limited short term gains.

No one denies the need for regionalization of waste treatment facilities. I believe a viable alternative would be to include Southern Delaware

County in a waste treatment plan utilizing the existing facilities located in Franklin County and the city of Columbus for a truly regional centralized waste treatment facility that would protect the urban greenbelt for the recreational use of Central Ohio citizens.

References

1. Division of Water, Ohio Department of Natural Resources. 1963. Water inventory of the Scioto River Basin. Ohio Water Plan Inventory, No. 17. 76 p.

2. Brungs, W. A. 1973. Effects of residual chlorine on aquatic life. Journal Water Pollution Control Federation, 45(10):2183-2193.

3. Ohio Department of Natural Resources. 1972. Natural Area and scenic river planning section. The Olentangy Scenic River Study. 48 p.

4. Ohio Cooperative Fishery Unit. Data files on evaluation of the sport fishery of the Olentangy River.

5. Ferry, E. W. 1974. The effect of stream improvement structures on the sport fishery in a channelized section of the Olentangy River. M.S. Thesis, The Ohio State University, School of Natural Resources. 130 p.

List of Fishes collected in the Olentangy River by members and staff of the Zoology Department, The Ohio State University at stations from Powell Road to the confluence with the Scioto River.

Gizzard Shad
Grass Pickerel
Quillback Carpsucker
Silver Redhorse
Black Redhorse
Golden Redhorse
Hogsucker
White Sucker
Carp
Goldfish
Golden Shiner
Hornyhead Chub
Blacknose Dace
Creek Chub
Suckermouth Minnows
Redbelly Dace
Silver Shiner
Rosyface Shiner
Rosefin Shiner
Striped Shiner
Steelcolor Shiner
Spotfin Shiner
Sand Shiner
Mimic Shiner
Silver Jaw Minnow
Fathead Minnow
Bluntnose Minnow
Stoneroller
Channel Catfish
Yellow Bullhead
Brown Bullhead
Black Bullhead
Stonecat Madtom
Brindled Madtom
Troutperch
Silversides
White Bass
White Crappie
Black Crappie
Rock Bass
Smallmouth Bass
Largemouth Bass
Green Sunfish
Bluegill
Orange Spotted Sunfish
Longear Sunfish
Logperch
Johnny Darter
Greenside Darter
Banded Darter
Rainbow Darter
Orangethroated Darter
Barred Fantail Darter
Bluebreasted Darter
Pumpkinseed Sunfish
Blackstriped Topminnow
Spotted Darter
Northern River Carpsucker
Blackside Darter
Walleye
Muskellunge

SCHUETTE CONSTRUCTION CO.
3192 SELDOM SEEN ROAD
POWELL, OHIO 43065
(614) 889-1748

Member of LICA

June 11, 1975

Ms. Cathy Grissom
U.S. Environmental Protection Agency
Region V Planning Branch
230 South Dearborn Street
Chicago, Illinois 60604

Dear Ms. Grissom:

The following are the slides you requested at the recent meeting you held at the Olentangy High School, Delaware, Ohio.

Find enclosed the slides and their locations spotted on the county map.

EPA #1
The location of this site is along St. Rt. #315 approximately 1 mile north of the proposed site of the county sewage treatment plant. This is on the west side of the highway. The Olentangy River is on the east side of this highway. The slide shows sewage with detergent flowing along the berm of the highway.

EPA #2
This is the same location as EPA #1 except that it is approximately 75' south, where the effluent pools and flows across Rt. #315 into the river. The effluent seems to be clearer in this slide. This is caused by automobiles driving through. When the autos drive through it most of the floating materials are hurled through the air and onto the surrounding landscape.

EPA #3
This slide was taken along side of Home Rd. approximately 1/2 mile east of the Olentangy River. It shows sewage effluent running in the road ditch which empties into the Olentangy River.

EPA #4
This slide was taken along side of Home Rd., just west of U. S. Highway #23. This area, being further east than that shown on slide EPA #3, drains to the east into a ravine which flows west into the Olentangy River.

EPA #5
This slide was taken in the road ditch on Seldom Seen Rd. (Twp. #121). It shows effluent from on-lot sewage systems which seeps into the road ditch. This road ditch drains into a small run which empties into the O'Shaughnessy Reservoir which supplies a part of the city of Columbus with water.

EPA #6
This slide was taken in the road ditch on Rutherford Rd. (Twp. #122) approximately 1½ miles east of the O'Shaughnessy Reservoir. This ditch empties into a small stream which winds through a subdivision and empties into the Scioto River.

EPA #7
This slide was taken in the area just west of St. Rt. #257 across the highway from a package sewage plant that serves Round Hill Estates. When I took this slide I was standing in the public park on the shores of the O'Shaughnessy Reservoir. Needless to say, this area of the park isn't used to capacity. Round Hill Estates are located at 10,000 Riverside Drive.

All of the slides EPA #1 through EPA #7 were taken the Sunday before you were here for the meeting with us at Olentangy High School. At that particular time we had not had any rain for fifteen days in this area. All of these areas would have been dry, if there wasn't sewage effluent flowing into them. (May 18)

EPA #8
This is an older slide taken in 1967 of the back yard of a home on Hyatts Rd. just west of U.S. Highway #23. There are cattails growing over a leach bed of an on-lot sewage unit. This area today does not have cattails as the homeowner sprayed them. It now is rank with marsh grass as it is too wet to mow. The effluent which runs off of this area runs into a small stream which empties into the Olentangy R.

These are but a few of the many situations that exist all over Delaware County. I would be very willing to show you or any of your personnel working on this impact statement these and many more similar situations in person, if you desire.

With the ever increasing influx of residents into Delaware County the only thing that can keep this problem from getting worse is a central sewage plant.

Thank you for the opportunity to submit these slides for the study and any further information I can supply.

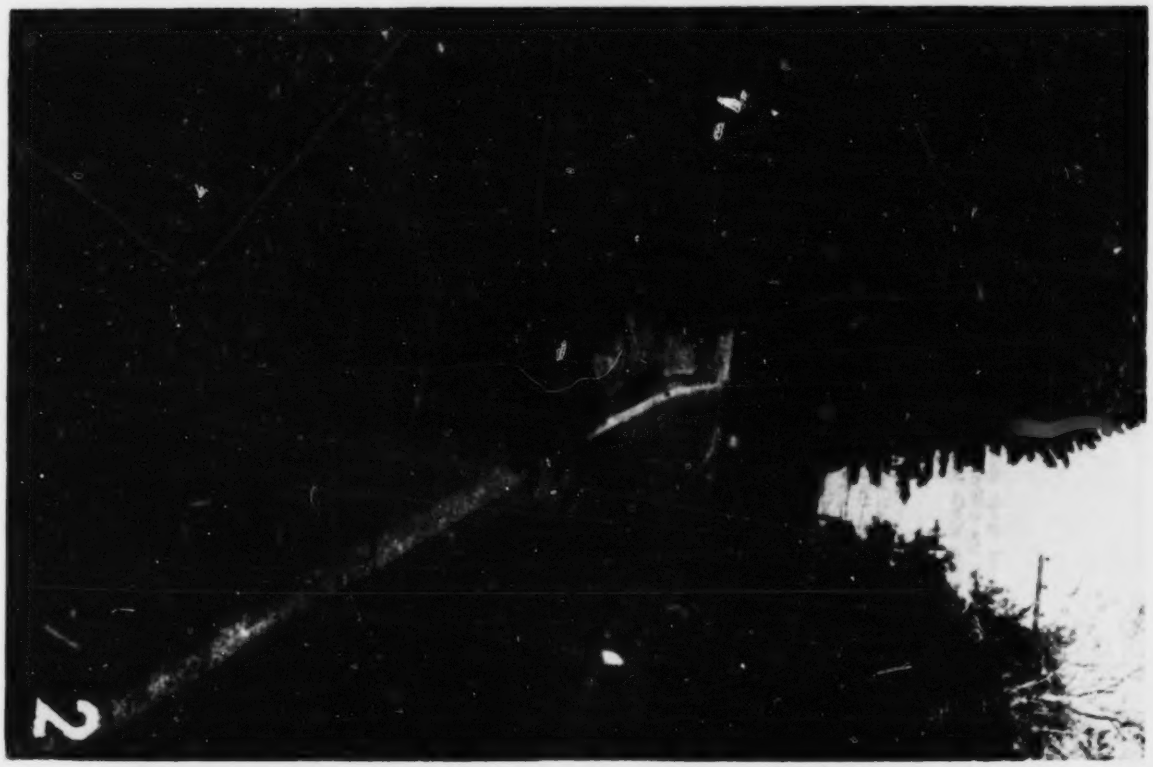
Sincerely,

John R. Schuette

Mr. John R. Schuette

JRS/ms

1



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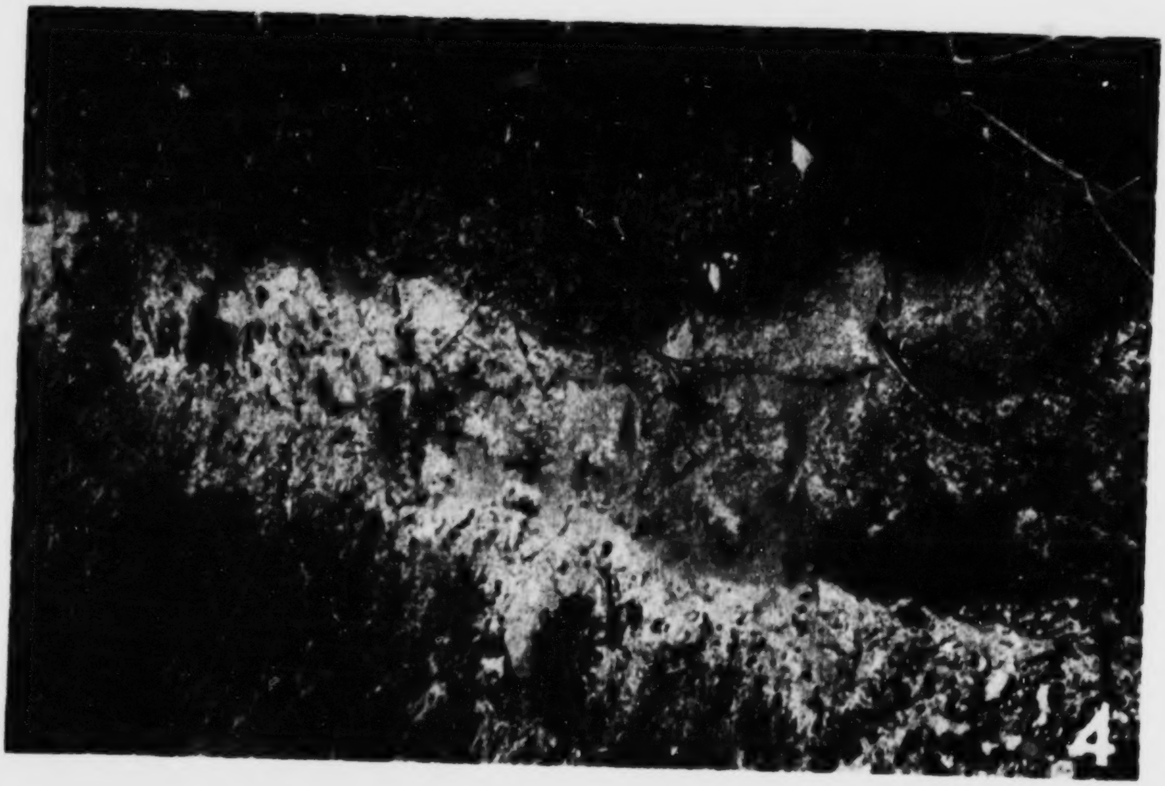

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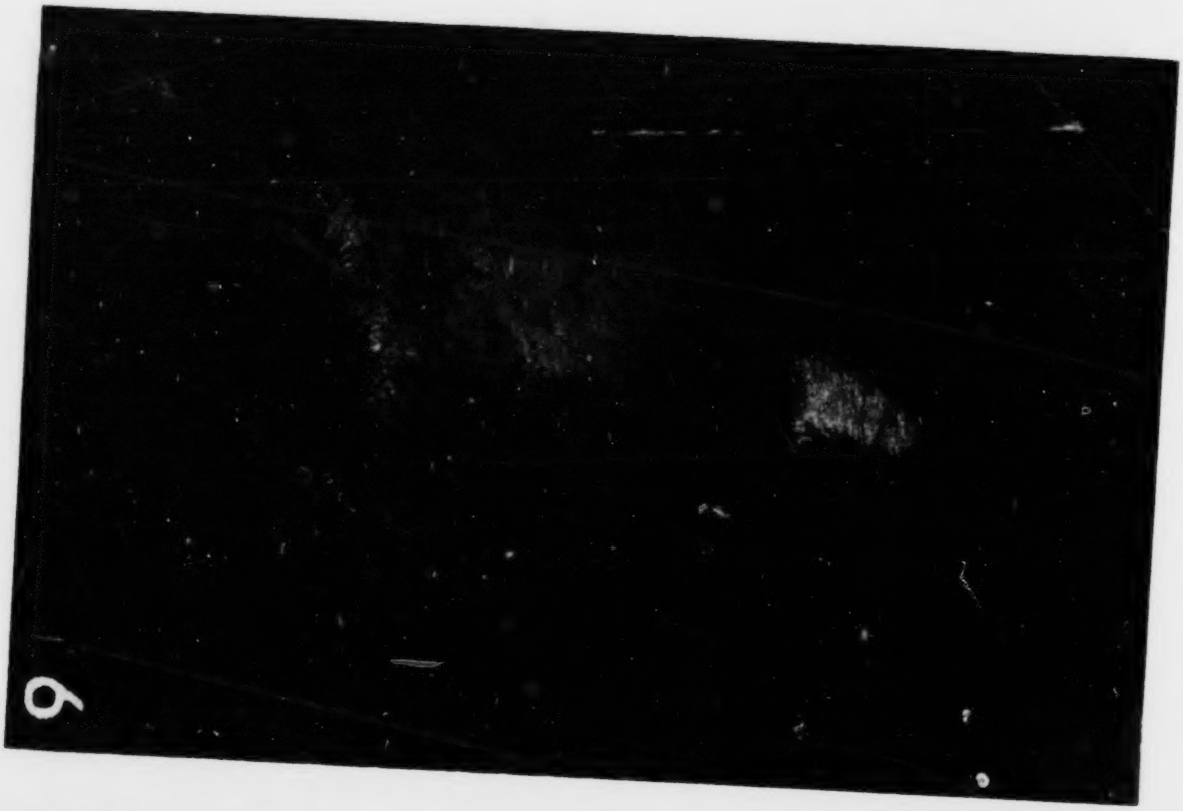

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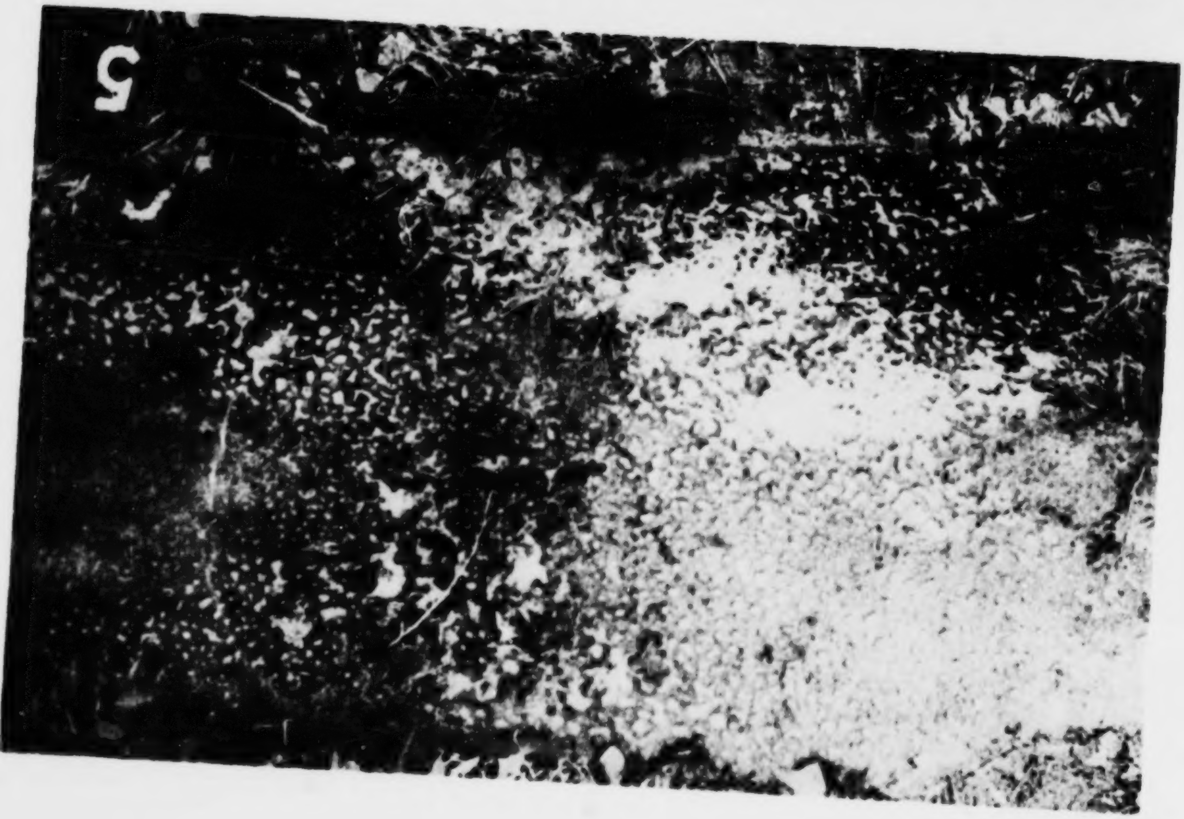

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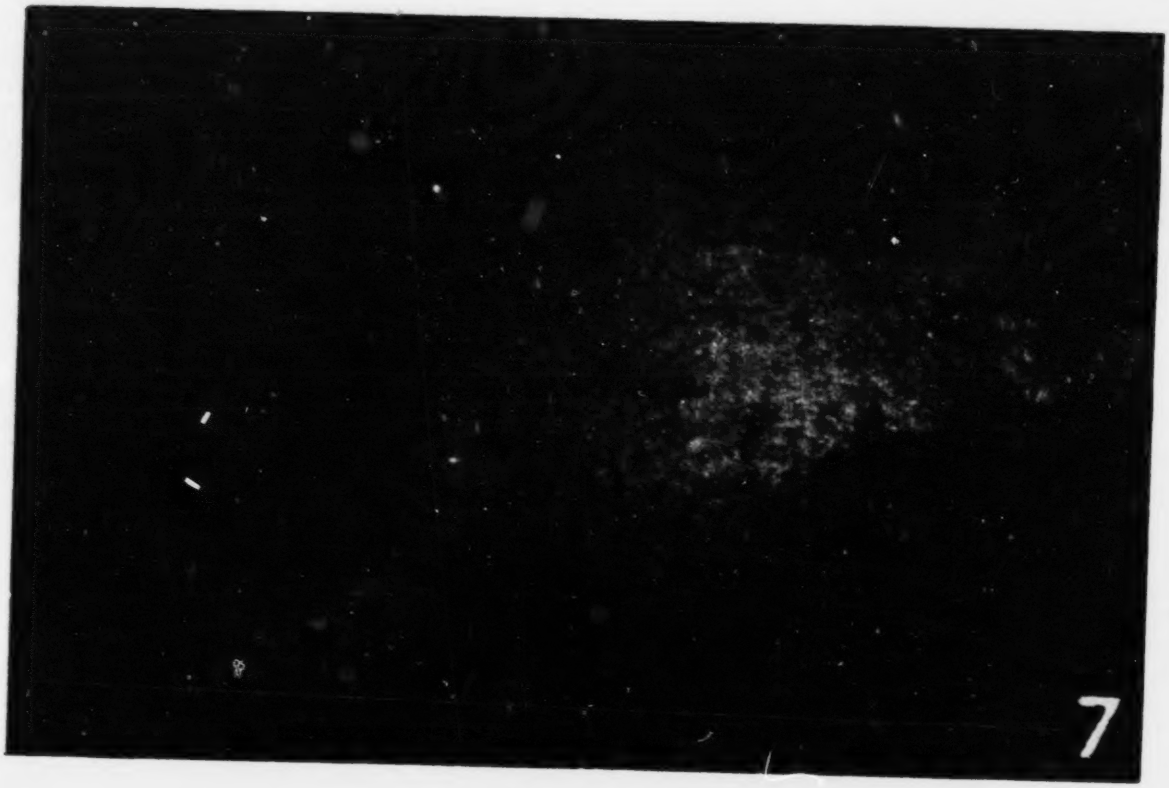

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United States Department of the Interior
FISH AND WILDLIFE SERVICE
Federal Building, Fort Snelling
Twin Cities, Minnesota 55111

IN REPLY REFER TO:
ES-PER

JUL 21 1975

Mr. Ned E. Williams
Ohio EPA
450 East Town Street
P.O. Box 1049
Columbus, Ohio 43216

RE: Powell Sewage Treatment Plant
Powell, Ohio
Board of County Commissioners
Delaware County
OEPA Permit No: K 901 *AD

Dear Mr. Williams:

The U.S. Fish and Wildlife Service has reviewed the referenced proposed facility and associated material describing the discharges and conditions under which the applicant proposes to operate the facility. This supercedes our letter of March 24, 1975. Our comments are submitted under the authority of and in accordance with the provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

On March 24, 1975, the Service sent a "no action" letter to the Ohio Environmental Protection Agency (EPA) to indicate that we did not have available resources, at the time, to make an investigation of the applicant's proposed facility and present our comments and recommendations. The subject permit became effective May 6, 1975. Since that time, possible problems of having the sewage treatment plant (STP) located at the proposed site and discharging into the Olentangy River have been brought to our attention by several sources. For this reason a biologist from our Lebanon, Ohio, field office made an onsite investigation of the proposed plant site on May 28, 1975. Our concerns, which are explained below, are followed by recommendations that we have determined to be necessary to protect fish and wildlife resources of the affected areas.

The applicant proposes to construct a sewage treatment plant with an average effluent flow of 1.5 million gallons per day (MGD) approximately one-fourth mile north of the Delaware-Franklin County line. We understand that the location of the STP will be within the flood plain but above the 100-year flood level. A March 28, 1975 memorandum from the U.S. EPA further indicated that the initial capacity of the STP would be 1.5 MGD with a 3.4 MGD peak flow capacity. Further expansion is planned to 6.0 MGD with 9.6 MGD peak flow. The effluent will enter the Olentangy River opposite the Highbanks Metropolitan Park located north of the Franklin-Delaware County line. The affected reach of the Olentangy River represents one of several streams in central Ohio with a water quality adequate to support a substantial warmwater sport fishery as indicated by the following surveys.

Reproduced from best available copy.

In a partial creel survey conducted on the Olentangy River from June 3, 1974 to September 24, 1974 (Weber, 1974) fishermen were interviewed on each of the 49 survey days at three 1,000-meter reaches of the river--at Powell Road, I-270, and Henderson Road. The Powell Road site is characteristic of the natural river and is located about 1 mile upstream from the proposed outfall. At the intersection of Interstate 270, the Ohio Department of Transportation has constructed a series of 5 artificial riffle-pool complexes which provide fish habitat along with a well maintained public access. This area is located about 2 miles downstream from the proposed outfall. The sampling area at Henderson Road, 4 miles below the outfall, is characteristic of an old channelized river in an advanced stage of recovery. The creel census data was extrapolated to include the entire June-September period for these three sites. The summarized data follow:

Total fishermen	1,560
Number fishermen-hours	2,753
Number of fish caught	1,079

Groups and species of fish caught expressed as a percentage include:

Rock Bass	34%
Sunfish	29%
Smallmouth bass	26%
Channel catfish	6%
Other	5%

More detailed creel census information is given in Table 1 of the Appendix. In addition, extensive electrofishing has been done in these three 1,000-meter sections of the river. This data is compiled by month in Table 2 of the Appendix. The fish population, which includes smallmouth bass and pan fish in abundance, is indicative of a healthy warmwater stream environment.

The Ohio State University, Department of Zoology, conducted other fishery surveys of the affected reaches of the Olentangy River and have found the spotted darter (Etheostoma maculatum), an endangered fish for the State of Ohio (Ohio's Endangered Wild Animals, Publication 316, Ohio Department of Natural Resources, Division of Wildlife). Further, dead shells of two State of Ohio endangered mollusks, cob shell (Quadrula cylindrica) and northern riffle shell (Epioblasma torulosa rangiana), were found in a November 1974 study of the area (Stein, 1975).

Two parameters limited in the proposed permit could be detrimental to aquatic life, especially during low-flow conditions: ammonia which is limited to 1.5 mg/l for both a 30-day mean and a 7-day mean during the 12-month period, and residual chlorine which is limited to 0.5 mg/l.

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Un-ionized Ammonia

Various fish species have yielded mean 96-hour LC_{50} values of 0.29 to 0.89 mg/l of un-ionized ammonia (Ball 1967). Exposure of carp to sublethal un-ionized ammonia concentrations in the range of 0.11 to 0.34 mg/l resulted in extensive necrotic changes and tissue disintegration in various organs (Flis, 1968). The maximum acceptable concentration of un-ionized ammonia in water is 0.05 of the 96-hour LC_{50}. We understand that the un-ionized ammonia form is very persistent in the aqueous medium. If pH and temperature remain constant, un-ionized ammonia remains toxic until dilution reduces the concentration.

The concentration of toxic un-ionized ammonia is calculated from the concentration of total ammonia limited in the proposed permit. Since the percentage of resulting un-ionized ammonia is dependent on pH and temperature, these parameters must be considered in the calculations.

Using a pH of 9 allowable in the proposed permit, and a maximum temperature of 30° C, the final limitation of un-ionized ammonia could be 0.01 mg/l (Thurston, et al., 1974). U. S. EPA (1973) recommends that the concentration of un-ionized ammonia be limited to 0.02 mg/l, or less, for the protection of aquatic life. A dilution factor of 40.5 would be required to reduce un-ionized ammonia concentration to non-toxic levels under these conditions. We understand from the U. S. Army, Corps of Engineers that the minimum flow release from the Delaware Reservoir is set at 5 cubic feet per second (cfs) or 3.232 MGD. The 7-day 2-year low flow for the Olentangy River at Stratford is 3.735 MGD (Cross, 1965). Under such conditions effluent from the proposed facility would only be diluted 2.5 times, thus allowing toxic concentrations of un-ionized ammonia beyond the mixing zone.

Although the above values are possible, the following table utilized ranges of data from the U. S. Geological Survey, Water Resources Data for Ohio collected at the gauging station on the Olentangy River near Worthington, Ohio.

Table 1 indicates that under certain physical and chemical conditions likely to occur in the Olentangy River, un-ionized ammonia will be toxic to aquatic life. During peak load operations of the STP and with the increased volume of discharge due to projected expansion of the applicant's facilities, the concentration of un-ionized ammonia remains toxic at a lower pH and temperature. Such concentrations of toxic ammonia could exist in the Olentangy River over extended periods of the year.

In addition to the insurance of a minimum release of 5 cfs from the Delaware Reservoir, we understand from Corps of Engineers personnel that additional water (20 to 40 cfs total) has been released from the

TABLE 1. Using 1.5 mg/l for the concentration of total ammonia nitrogen in the proposed permit, calculations of un-ionized ammonia are indicated for a pH range of 7.5 to 8.5 and a temperature range of 15°C to 25°C. Dilution factors (DF) required to obtain a safe concentration of un-ionized ammonia for aquatic life are shown in the second row. Dilution factors for volume of flow are based on 20 cfs (12.926 MGD) flow of the receiving water obtained from data presented in Table 2.

	pH 7.5/15°C	pH 7.5/20°C	pH 7.5/25°C	pH 8.0/15°C	pH 8.0/25°C	pH 8.0/25°C	pH 8.5/15°C	pH 8.5/20°C	pH 8.5/25
Concentration un-ionized ammonia (mg/l)	0.02	0.02	0.03	0.05	0.07	0.10	0.15	0.20	0.28
Dilution Factor (DF) required safe for aquatic life	1.0	1.0	1.5	2.5	3.5	5.0	7.5	10.0	14.0
1.5 MGD effluent provides 8.6 DF	+ *	+	+	+	+	+	+	- **	-
4.4 MGD effluent provides 3.8 DF	+	+	+	+	+	-	-	-	-
6.6 MGD effluent provides 2.2 DF	+	+	+	-	-	-	-	-	-
9.2 MGD effluent provides 1.4 DF	+	+	-	-	-	-	-	-	-

* + = safe concentration of un-ionized NH_3 for aquatic life after dilution with the receiving water

** - = toxic concentration of un-ionized NH_3 for aquatic life after dilution with the receiving water reservoir to aid in controlling pollution of the Scioto River below Columbus, Ohio. There is, however, no binding agreement for this pollution abatement measure. An independent water treatment firm uses water from the Olentangy River downstream from the Delaware Reservoir. If the STP is built, this firm plans to increase its operations, which would decrease flows of the river affected by the proposed STP. Table 2 indicates periods of the water years 1961 to 1970 when the flow in the Olentangy River was 20 cfs or less, at which times (11.4%) such flows, under conditions indicated, would be inadequate to dilute toxic levels of un-ionized ammonia. It should also be noted that low-flow conditions are usually associated with the summer and early autumn when water temperatures of the streams are near maximum upper limits. The minimum flow for the consecutive 10-year period was 7.6 cfs.

TABLE 2. Periods of 4 consecutive days (96 hours), or more, in which the flow in Olentangy River near Worthington was 20 cfs, or less for water years 1961 to 1970.

Water year (Oct.-Sept.)	Total number of days with flow at 20 cfs or less	Periods (of 4 or more consecutive days)
1961	36	Dec. 9-13; Dec. 17-Jan. 13
1962	50	May 23-27; Jun. 2-5; Jun. 8-11; Jun. 13-23; Jun. 25-Jul. 2
1963	26	Jun. 26-Jul. 1; Jul. 7-12; Sept. 4-11; Sept. 14-30
1964	110	Oct. 1-Nov. 6; Nov. 24-Jan. 17; Sept. 13-19; Sept. 21-30
1965	59	Oct. 1-Nov. 16; Jun. 21-30
1966	15	Sept. 13-19; Sept. 23-30
1967	36	Oct. 1-10; Oct. 12-15; Oct. 18-24; Sept. 13-27
1968	25	Oct. 1-5; Oct. 11-16; Sept. 14-21
1969	41	Oct. 12-16; Oct. 19-28;Oct. Nov. 6
1970	18	Sep.. 13-30

Residual Chlorine

The toxicity of chlorine in water to aquatic life depends on the concentration of residual chlorine and choramines which are formed when chlorine is in contact with nitrogenous materials. Choramines, however, are not monitored in the proposeo permit. It has been shown that total numbers of fish and diversity of fishes in receiving waters are drastically reduced by chlorinated sewage effluents (Tsai, 1968, 1970). Zillich (1972) determined that the threshold toxicity for fathead minnow (Pimephales promelas) was 0.04-0.05 mg/l residual chlorine. The survival of Gammarus, an important food source for game fish, was reduced at 0.04 mg/l and reproduction was reduced at 0 0034 mg/l.

U.S. EPA (1973) recommends that the concentration of residual chlorine in the receiving waters should not exceed 0.003 mg/l at any time or place for the protection of aquatic life. If 0.5 mg/l were discharged, a dilution factor of about 166 would be required to reduce residual chlorine concentrations to non-toxic levels. Again, under low-flow conditions of 3.736 MGD, the effluent would be only diluted 2.5 times.

It can be concluded that if concentrations of ammonia and residual chlorine described in the issued permit are allowed, important populations of game fish along with forage fish and aquatic invertebrates will be seriously reduced or eliminated in the Olentangy River.

RECOMMENDATIONS

It is recommended that the permit for the proposed discharge be modified to include the following conditions:

1. That the effluent limitation on ammonia nitrogen should be such that un-ionized ammonia concentration in the receiving waters will not exceed 0.02 mg/l. Further, we recommend that ammonia nitrogen be ultimately limited in the receiving waters as determined by bioassays, performed by the applicant within two years after permit issuance, using the receiving water and the most sensitive aquatic fish and/or invertebrate species in the locality to determine possible acute and chronic effects of the discharge on these organisms. Provided further, that the U.S. Fish and Wildlife Service and other interested Federal and State agencies will be afforded the opportunity to review the results of these bioassays and submit subsequent recommendations.

2. That the effluent limitation on residual chlorine should be such that it will not exceed 0.003 mg/l in the receiving waters.

We would appreciate a response to this letter as to what action you plan to take with respect to our recommendations.

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Sincerely yours,

(Sgd C E FAULKNER

ing Regional Director

cc: U.S. EPA, Permits Branch, Chicago
Chief, Ohio Div. of Wildlife, Columbus
Mr. Bossu, NMFS, Gloucester
Mr. Edward F. Hutchins, Metropolitan Park District of Columbus
and Franklin Counties, Westerville
Mr. John T. Cunco, Enviro Control, Rockville
Mr. Marlon Hirt, Region 5 Planning Branch, U.S. EPA, Chicago

Appendix Table 1. Summary of creel census data for the Olentangy River taken by the Ohio Cooperative Fishery Research Unit. Census represents randomly selected 4-hour time blocks on 50 randomly selected days between April 1 and October 30.

	1972		1973		1974	
	Powell Road	I-270	Powell Road	I-270	Powell Road	I-270
Total No. Anglers Interviewed	36	269	89	199	85	145
Total Angler-hours	54	361	124	253	167	232
Hours/Angler	1.49	1.34	1.39	1.27	1.97	1.60
Catch/Hour	0.78	0.46	1.39	0.71	0.71	0.55
Total No. Fish Caught	55	165	172	181	119	127

Appendix Table 2. Catch by electrofishing three 1000-meter sites on the Olentangy River compiled by monthly sampling periods (A-F)

Area A = Powell Road
Area B = Interstate 270
Area C = Henderson Road

as follows:

Reproduced from best available copy.

4-5 May 1974

	Area A	Area B	Area C
Gizzard Shad	0.008 (1)*	--	0.315 (35)
Muskellunge	—	0.005(1)	—
Goldfish	0.008(1)	--	0.018(2)
Carp	0.321(36)	0.374(64)	0.774(86)
Quillback Carpsucker	0.080(9)	0.035(6)	0.126(14)
White Sucker	—	0.029(5)	0.072(8)
Hog Sucker	0.017(2)	0.052(9)	0.036(4)
Black Redhorse	0.044(5)	—	—
Golden Redhorse	0.241(27)	0.274(47)	0.306(34)
Black Bullhead	0.008(1)	—	0.081(9)
Yellow Bullhead	0.017(2)	0.052(9)	0.009(1)
Channel Catfish	0.008(1)	0.006(1)	0.009(1)
White Bass	—	0.011(2)	--
Rock Bass	0.160(18)	0.193(33)	0.027(3)
Green Sunfish	0.035(4)	0.210(36)	0.036(4)
Bluegill Sunfish	0.071(8)	0.070(12)	0.036(4)
Longear Sunfish	0.714(80)	0.614(105)	0.252(28)
Smallmouth Bass	0.258(29)	0.590(101)	0.072(8)
White Crappie	0.071(8)	0.052(9)	0.198(22)
Black Crappie	0.008(1)	0.040(7)	0.54(6)
Log Perch	--	0.005(1)	--

*Figures Represent Catch Per Minute
**Figures in Parentheses Represent Total Number of Fish Taken

Table 7-A

10-14 June 1974

	Area A	Area B	Area C
Goldfish	--	--	[illegible]
Carp	0.225(46)**	0.182(64)	[illegible]
Quillback Carpsucker	0.029(6)	0.034(12)	[illegible]
White Sucker	0.049(10)	0.094(33)	0.031([illegible])
Hog Sucker	[illegible]	0.008(3)	—
Silver Redhorse	0.063(13)	--	[illegible]
Black Redhorse	0.068(14)	0.002(1)	—
Golden Redhorse	0.274(56)	0.207(73)	[illegible]
Black Bullhead	—	—	[illegible]
Yellow Bullhead	0.024(5)	0.008(3)	—
Channel Catfish	0.004(1)	0.002(1)	--
Rock Bass	0.377(77)	0.287(101)	0.008(1)
Green Sunfish	0.098(20)	0.752(264)	0.154(20)
Orangespot Sunfish	—	—	0.031([illegible])
Bluegill Sunfish	0.059(12)	0.136(48)	[illegible]
Longear Sunfish	0.500(102)	0.538(189)	[illegible]
Smallmouth Bass	0.323(66)	0.407(143)	[illegible]
White Crappie	0.117(24)	0.022(8)	0.079([illegible])
Black Crappie	—	0.014(5)	[illegible]
Log Perch	—	0.002(1)	--
Walleye	0.009(2)	0.005(2)	0.008(1)

* Figures Represent Catch Per Minute
** Figures in Parentheses Represent Total Number of Fish Taken

Table [illegible]

25-26 July 1974

[illegible]	Area A	Area D	Area C
Goldfish	*0.033(5)**	--	--
Carp	0.559(86)	0.189(71)	0.300(60)
Quillback Carpsucker	0.125(19)	0.010(4)	0.005(1)
White Sucker	0.119(18)	0.160(60)	0.010(2)
Hog Sucker	0.059(9)	0.024(9)	0.010(2)
Silver Redhorse	0.119(18)	0.010(4)	0.035(7)
Black Redhorse	0.205(31)	0.120(45)	—
Golden Redhorse	0.185(28)	0.187(71)	0.355(71)
Shorthead Redhorse	—	—	0.010(2)
Black Bullhead	—	--	0.020(4)
Yellow Bullhead	0.013(2)	0.040(15)	0.020(4)
Channel Catfish	0.006(1)	0.008(3)	0.015(3)
Stonecat Madtom	0.013(2)	—	—
Tadpole Madtom	0.006(1)	—	--
Rock Bass	0.754(114)	0.200(75)	0.030(6)
Green Sunfish	0.105(16)	0.526(197)	0.140(28)
Orangespot Sunfish	—	0.003(1)	0.070(14)
Bluegill Sunfish	0.165(25)	0.171(64)	0.100(20)
Longear Sunfish	0.721(109)	0.433(162)	0.255(51)
Smallmouth Bass	0.125(19)	0.358(134)	0.045(9)
White Crappie	0.046(7)	0.040(15)	0.065(13)
Black Crappie	0.052(8)	0.074(28)	0.060(12)
Greenside Darter	0.013(2)	—	—
[illegible] Darter	—	0.003(1)	--
[illegible]	[illegible]	[illegible]	--

*Figures Represent Catch Per Minute

Table 7-C

[illegible]

26 August - 5 September 1974

	Area A	Area B	Area C
Gizzard Shad	*0.090(11)**	0.124(30)	0.450(60)
Goldfish	0.057(7)	--	0.015(2)
Carp	0.450(55)	0.170(44)	0.137(18)
Quillback Carpsucker	0.016(2)	0.020(5)	—
White Sucker	0.049(6)	0.203(49)	0.022(3)
Hog Sucker	0.081(10)	0.020(5)	—
Silver Redhorse	0.098(12)	0.016(4)	0.022(3)
Black Redhorse	0.098(12)	0.024(6)	0.075(10)
Golden Redhorse	0.163(20)	0.116(28)	0.213(28)
Shorthead Redhorse	—	0.004(1)	—
Black Bullhead	--	--	0.022(3)
Yellow Bullhead	0.040(5)	0.041(10)	—
Channel Catfish	0.008(1)	—	—
Stonecat Madtom	0.024(3)	—	—
Rock Bass	0.557(68)	0.107(26)	0.015(2)
Green Sunfish	0.122(15)	0.414(100)	0.075(10)
Orangespot Sunfish	—	—	0.007(1)
Bluegill Sunfish	0.285(35)	0.178(43)	0.038(5)
Longear Sunfish	0.565(69)	0.199(48)	0.137(18)
Smallmouth Bass	0.188(23)	0.448(108)	0.030(4)
Largemouth Bass	—	0.029(7)	0.022(3)
White Crappie	0.122(15)	0.016(4)	0.038(5)
Black Crappie	0.155(19)	0.033(8)	0.022(3)
Greenside Darter	--	0.004(1)	--
[illegible]	[illegible]	[illegible]	--

*Figures Represent Catch Per Minute
**Figures in Parentheses Represent Total Number of Fish Taken

Table [illegible]

CATCH BY ELECTROFISHING

Olentangy River

November 1, 3, & 4, 1974

	A	B	C
Gizzard Shad	*0.032(4)**	0.137(23)	2.950(354)
Muskellunge	--	0.006(1)	--
Stoneroller	0.317(40)	0.006(1)	--
Goldfish	0.024(3)	0.006(1)	--
Carp	0.341(43)	0.274(46)	0.317(38)
Silver Shiner	0.381(48)	0.030(5)	--
Spotfin Shiner	0.230(29)	--	--
Bluntnose Minnow	0.135(17)	0.024(4)	0.025(3)
Quillback Carpsucker	0.159(20)	0.119(20)	0.108(13)
White Sucker	0.063(8)	0.095(16)	0.092(11)
Hog Sucker	0.198(25)	0.012(2)	0.008(1)
Silver Redhorse	0.063(8)	0.060(10)	0.067(8)
Black Redhorse	0.063(8)	0.024(4)	--
Golden Redhorse	0.714(90)	0.452(76)	0.292(35)
Shorthead Redhorse	--	0.012(2)	--
Brown Bullhead	--	--	0.084(10)
Yellow Bullhead	0.063(8)	0.095(16)	0.042(5)
Channel Catfish	0.016(2)	0.054(9)	0.008(1)
Stonecat	0.055(7)	--	--
Brook Silversides	--	0.024(4)	--
Rock Bass	1.333(168)	0.607(102)	0.033(4)

*Number of Fish Caught Per Minute
**Total Number of Fish Caught (Number in Parentheses)

Table 2-K

Area A = Unchannelized
Area B = Modified Channel with Riffle Pools
[illegible]

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CATCH BY ELECTROFISHING

Olentangy River

November 1, 3, & 4, 1974

	A	B	C
Green Sunfish	*[illegible]**	[illegible]	0.157([illegible])
Orange Spotted Sunfish	0.008(1)	0.012(2)	0.017(2)
Bluegill	0.349(44)	0.345(58)	0.100(12)
Longear Sunfish	0.786(99)	1.018(171)	0.292(35)
Smallmouth Bass	1.087(137)	1.827(307)	0.175(21)
Largemouth Bass	0.087(11)	0.220(37)	0.058(7)
White Crappie	0.222(28)	0.077(13)	0.150(18)
Black Crappie	0.357(45)	0.143(24)	0.050(6)
Rainbow Darter	0.024(3)	--	--
Log Perch	0.302(38)	0.083(14)	--
Walleye	0.008(1)	--	--

*Number of Fish Caught Per Minute
**Total Number of Fish Caught (Number in Parentheses)

Area A = Unchannelized
Area B = Modified Channel with Riffle Pools
Area C = Old Channelized

Table 2-F

DEPARTMENT OF THE ARMY
HUNTINGTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 2127
HUNTINGTON, WEST VIRGINIA 25721

REPLY TO
ATTENTION OF:
ORHED-HO

31 July 1975

Mr. Harlan D. Hirt
Chief, Planning Branch
United States Environmental Protection
  Agency
230 South Dearborn Street
Chicago, Illinois 60604

Dear Mr. Hirt:

The present low-flow release schedule for Delaware Lake, which you requested in your letter of 24 June 1975, is tabulated below:

Period	Scheduled Discharge
1-10 July	10 c.f.s.
11-20 July	25
21-31 July	35
1-20 August	40
21-31 August	35
1 September-31 October	20
Minimum Release	5

Low-flow discharges as listed above are released from storage when inflows are insufficient to maintain the required flows.

Storage for low-flow releases were authorized during the planning phase of Delaware Dam and the schedule of releases has been periodically adjusted to better serve the needs of the Olentangy and Scioto River Basins.

Any future changes in release schedules or minimum discharges must be throughly investigated to ascertain that the best all-round use is made of the limited storage available for that purpose.

Alum Creek Lake will have a minimum release of 5 c.f.s. during periods of drawdown of the water supply pool and when inflows are insufficient to furnish the water supply requirements. Since maximum utilization of the water supply storage at Alum Creek Lake is not expected for several years, the amount of time necessary to release the minimum discharge will gradually increase until the ultimate utilization of available storage is attained.

Projected sewage treatment requirements for Alum Creek recreation areas are 74,500 gpd for a peak weekend during the recreation season. Accumulated sewage will be pumped to the Delaware County Severage collection system for treatment and eventual discharge into the Olentangy River.

Inquires concerning the Delaware County EIS may be directed to Mr. Charles Nelson (304-529-2318, Ext 2135).

Sincerely yours,

Bo Copley
BO COPLEY
Asst Chief, Engineering Division

Copies furnished:
Mr. Robert L. Lucas
Staff Coordinator for
  Corps of Engineers Activities
Ohio Department of Natural
  Resources
Fountain Square
Building No. 7 - 3rd Floor
Columbus, Ohio 43224

Mr. Fred Stults
County Engineer
50 Channing Street
Delaware, Ohio 43015

Mr. Edward F. Hutchins
Director-Secretary
Metropolitan Park District of
  Columbus and Franklin County
P. O. Box 72
999 Park Road
Westerville, Ohio 43081

OHIO BIOLOGICAL SURVEY
INTER-INSTITUTIONAL RESEARCH SINCE 1912

103 Biological Sciences Building
The Ohio State University
484 West 12th Avenue
Columbus, Ohio 43210

Phone: 614-422-9645

December 8, 1975

Mr. Harlan D. Hirt, Chief
Planning Branch Region V
U.S. Environmental Protection Agency
230 South Dearborn Street
Chicago, Illinois 60604

Dear Mr. Hirt:

The Ohio Biological Survey is currently under contract to the U.S. Army Corps of Engineers, Huntington District, completing an environmental inventory and analysis of the Central Ohio region. The study area includes the Scioto River watershed. Several items relevant to the proposed Powell Sewage Treatment Plant on the Olentangy River are included in the report. The water quality of that stretch of the Olentangy River has been evaluated to be "Relatively Good Quality," the highest quality category in the study area. Also modern records of four species of molluscs on the Ohio Division of Wildlife Endangered Species list are reported for the same stretch of the river. The type localities of five plant species are located in the general area, although these are very difficult if not impossible to locate precisely. The visual quality rating of the landscape in the area of the proposed plant is evaluated as high and medium high.

This stretch of the Olentangy is one of the finest scenic areas in Central Ohio and construction would be an environment intrusion into a high quality area. I would recommend that every alternative be thoroughly investigated before authorizing development of this facility.

Sincerely,

Charles C. King

Dr. Charles C. King
Executive Director

CCK:jkp

ENVIRONMENTAL PROTECTION AGENC
RECEIVED
DEC 10 1975
PLANNING BRANCH - Region V
FILE NO. ____

COOPERATING INSTITUTIONS AND MEMBERS OF THE ADVISORY BOARD

6-70

Planning
Branch

DEPARTMENT OF THE ARMY
HUNTINGTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 2127
HUNTINGTON, WEST VIRGINIA 25721

REPLY TO
ATTENTION OF:

ORHED-PP

2 April 1976

Regional Administrator
ATTN: Mr. Merle V. Tellekson
Region V
U.S. Environmental Protection Agency
230 South Dearborn Street
Chicago, IL 60604

Dear Mr. Tellekson:

I refer to a recent telephone conversation between William Holliday of our Planning staff and Kathy Grissom of your Planning Branch regarding the possibilities for increasing assured minimum stream flow along the Olentangy River at the site of the proposed Delaware County regional sewage treatment plant.

Conceivably, assured minimum flows could be increased by modifying the storages and/or operation of Delaware Lake or by constructing an additional reservoir for low flow augmentation purposes.

Previous studies indicate that minimum assured releases from Delaware Lake could be increased from 5.0 to 10.0 cubic feet per second without adjusting storage allocations for flood control. However, the increase would result in additional drawdown of the minimum pool, thereby infringing on sediment reserve capacity and adversely affecting recreation usage.

Increasing minimum releases beyond 10.0 c.f.s. would cause more substantial effects; adversely affecting flood control capability and/or interfering with recreational usage.

To evaluate the desirability of increasing minimum releases to 10.0 c.f.s. would require extensive, detailed studies for which we do have authority under our Central Ohio Survey, but for which no funds presently are available. If funding were available, such studies would require about nine months to conduct.

ORHED-PP
Mr. Merle W. Tellekson

2 April 1976

To evaluate an even greater increase in minimum releases, more extensive studies would be required. If the studies confirmed that the other project purposes would be adversely affected (i.e., significant on flood control or appreciable effect on recreational benefits) or that costs for physically modifying the project would be incurred, authorization by Congress would be required prior to implementation of such changes.

With regard to constructing an additional reservoir in the Olentangy River watershed, since any such reservoir would be an alternative to modifying Delaware Lake, studies for an additional reservoir would have to be a part of any study to modify Delaware Lake. Should an additional reservoir prove more desirable than modifying Delaware Lake, then it too would require authorization by Congress.

The evaluation of all alternatives is made more complex by the fact that the formulation and evaluation of plans must consider multiple-purpose development addressing all water and related land resources needs. Therefore, we would anticipate that studies leading to possible authorization by Congress would require a minimum of two years to complete.

Sincerely yours,

Scott B Smith
SCOTT B. SMITH
Colonel, Corps of Engineers
District Engineer

United States Department of the Interior

GEOLOGICAL SURVEY
Water Resources Division
975 West Third Avenue
Columbus, Ohio 43212

April 12, 1976

Mr. Eugene Wojcik, Acting Chief
EIS Preparation Service
U. S. Environmental Protection Agency
Region V
230 South Dearborn Street
Chicago, Illinois 60604

Dear Mr. Wojcik:

In answer to your letter of April 5 concerning low-flow values for the Olentangy River:

1. The 7-day, 10-year low-flow discharge prior to construction of Delaware dam is:

   a. At Statford gage 0.9 ft^3/s
   b. At the Franklin-Delaware County line 1.0 ft^3/s

2. The 7-day, 10-year low-flow discharge after Delaware Lake is:

   a. At the Worthington gage 10.2 ft^3/s
   b. At the Franklin-Delaware County line 9.7 ft^3/s

3. The estimated tributary contribution between Delaware Lake and the Franklin-Delaware County line during the 7-day, 10-year period is 0.3 ft^3/s.

4. The diagrammed analysis of low-flow conditions under regulated conditions, which is a revision of Fig. 5-1 of the Draft EIS on the Olentangy Environmental Control Center and Interceptor System, appears to be reasonable.

Sincerely yours,

James F. Blakey
District Chief

RIM/jae

Interstate 71 and 17th Avenue
the ohio historical society ohio historical center columbus, ohio 43211 telephone (614) 466-4663

May 20, 1976

Ms. Kathy Grissom
Planning Branch
USEPA
230 South Dearborn St.
Chicago, Illinois 60604

Dear Ms. Grissom:

I am writing in response to your request for data concerning the cultural resources, specifically prehistoric Indian material, that may be affected by the construction of the Olentangy Environmental Control Center and Interceptor System in south-central Delaware County, Ohio.

I have visited the site on two occasions and have collected cultural material--flint chips, spearpoints, scrapers, and knives and fragments of other stone tools--from the ground surface that indicate the area was indeed utilized by prehistoric American Indians. Our data plus that gathered by local amateur archaeologists suggests that the site was occupied perhaps by Palaeo-Indians (ca. 10,000-8000 B.C.), by Archaic (8000-1000 B.C.), Adena (1000 B.C.-AD 200), Hopewell (200 B.C.-AD 500), and Cole (ca. AD 700-1300) peoples. The Adena and Cole habitations may have been somewhat more extensive since two mounds (Adena) and the Highbanks Earthworks (Cole), sites considered to be focal points for the general area, are located across the river.

The cultural material was found on the ground surface in the cultivated areas. While it was scattered fairly generally throughout the site, it appeared to be in slightly greater concentrations on the higher elevations toward S.R. 315. This situation is typical of most portions of the Olentangy River valley, and implies that the waterway was extensively utilized by many cultures who established their camps and villages along its valley and took advantage of the rich flora and fauna and the ease of transportation it afforded. Although on the basis of the surface survey it would appear that the site may not be qualified for the National Register of Historic Places, it is quite possible that further work will reveal significant cultural data, particularly considering the area's proximity to the Highbanks sites.

In my opinion, the construction sites within the tract, including the locations of the sewage treatment plant itself, pipelines, roads, parking lots, and other disturbances, should be tested by a trained archaeologist. The program should involve excavation of test blocks of sufficient size, depth, and number to adequately sample the areas involved. The land adjacent to the river itself may require trenching with a backhoe since flood deposits that have accumulated could very well have buried occupation zones. As archaeological investigations take time to plan and execute, provisions for such work should be made as soon as possible after the final location of the facility is confirmed.

Similar surveys and testing programs should also be initiated along the routes of the proposed interceptor systems.

If you have any further questions, please feel free to contact me.

Sincerely,

Martha Potter Otto
Head, Dept. of Archaeology

MPO:dk

May 25, 1976

Ms. Kathy Grissom
Planning Branch
USEPA
230 South Dearborn St.
Chicago, Illinois 60604

Re: Olentangy Environmental Control Center and Interceptor System

Dear Ms. Grissom:

I have reviewed the letter of May 20, 1976, from Martha Potter Otto to you regarding the above project.

Based on the initial surface survey performed by Mrs. Otto, I am unable to give an opinion as to the eligibility of the archaeological site at this time. I would also concur that controlled test excavations will be necessary before a request for a determination of eligibility can be submitted to the Director, Office of Archaeology and Historic Preservation.

This statement may be used as confirmation of consultation with the State Historic Preservation Officer as part of the determination of eligibility procedures. However, all requests of the Secretary of the Interior should include a description of the site, a statement of significance, photographs and maps. Supplying this type of information requires further survey and testing of the plant site and interceptor routes. Plans for such investigations should be implemented as early in the planning process as possible!

For further information on the determination of eligibility process consult Section 800.4 (a) (2) of the Procedures of the Advisory Council on Historic Preservation.

Sincerely,

Thomas H. Smith
State Historic Preservation Officer
Director, Ohio Historical Society

THS:dk

Ohio Historic Preservation Office
Ohio Historical Center I-71 & 17th Avenue Columbus, Ohio 43211 (614) 466-8727

BURGESS & NIPLE
LIMITED
CONSULTING ENGINEERS AND PLANNERS

5085 REED ROAD
COLUMBUS, OHIO 43220
(614) 459-2050

COLUMBUS, OHIO
AKRON, OHIO
CINCINNATI, OHIO
MENTOR, OHIO
PARKERSBURG, W. VA.

WATERWORKS - SEWERAGE
INDUSTRIAL WASTES
TRANSPORTATION
UTILITY VALUATION
WATER RESOURCES
LAND DEVELOPMENT

May 25, 1976

ED
'76 MAY 25 AM 11:20
MGT. DIV. - GAB

Mr. George R. Alexander, Jr., Administrator
United States Environmental Protection Agency
Region Five
230 South Dearborn
Chicago, Illinois 60604

Attention: Mr. Henry L. Longest, II
Director of Water Division

Re: Delaware County, Ohio
Project No. C 390693

Dear Mr. Longest:

When the Delaware County officials, Kenneth Reed, Dean Miller, Fred Stults, Gary Gilbert and the writer met with Mr. Alexander and yourself on May 6, 1976, data in regards to contact with Columbus for taking the sewage by them was requested (Letters, memos, meetings, etc.). The County has requested us to furnish this information.

The original contact with Columbus was in 1969. A letter in regards to this contact dated September 2, 1969 was included as Exhibit I in the "Feasibility Survey and Report for Sanitary Service and Sewage Treatment Facilities" (January, 1970); copy attached.

On August 22, 1973, a meeting was held at the City of Westerville, Ohio offices with the following in attendance:

Fred L. Stults, P.E. - Delaware County, Sanitary Engineer
Gary W. Gilbert - Delaware County, Ass't. Sanitary Engineer
O. H. Koeplin - City of Westerville, City Manager
Thomas W. Singell, P.E. - City of Westerville, City Engineer
Richard D. Jackson, P.E. - City of Columbus, Director of Public Service
Robert C. Parkinson, P.E. - City of Columbus, Ass't. Director of Public Service
Forest Grant, Jr., P.E. - City of Columbus, Principal Design Engineer Sewerage and Drainage
Edward Wilson - Sunbury, Ohio
Unknown Attendee - Sunbury, Ohio
Paul M. Shepard, Jr., P.E.- Burgess & Niple, Limited

Founded 1912

May 25, 1976

Ms. Kathy Grissom
Planning Branch
USEPA
230 South Dearborn St.
Chicago, Illinois 60604

Re: Olentangy Environmental Control Center and Interceptor System

Dear Ms. Grissom:

I have reviewed the letter of May 20, 1976, from Martha Potter Otto to you regarding the above project.

Based on the initial surface survey performed by Mrs. Otto, I am unable to give an opinion as to the eligibility of the archaeological site at this time. I would also concur that controlled test excavations will be necessary before a request for a determination of eligibility can be submitted to the Director, Office of Archaeology and Historic Preservation.

This statement may be used as confirmation of consultation with the State Historic Preservation Officer as part of the determination of eligibility procedures. However, all requests of the Secretary of the Interior should include a description of the site, a statement of significance, photographs and maps. Supplying this type of information requires further survey and testing of the plant site and interceptor routes. Plans for such investigations should be implemented as early in the planning process as possible!

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Sincerely,

Thomas H. Smith
State Historic Preservation Officer
Director, Ohio Historical Society

THS:dk

Ohio Historic Preservation Office
Ohio Historical Center I-71 & 17th Avenue Columbus, Ohio 43211 (614) 466-8727

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WATERWORKS · SEWERAGE
INDUSTRIAL WASTES
TRANSPORTATION
UTILITY VALUATION
WATER RESOURCES
LAND DEVELOPMENT

May 25, 1976

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MGT. DIV. - GAB

Mr. George R. Alexander, Jr., Administrator
United States Environmental Protection Agency
Region Five
230 South Dearborn
Chicago, Illinois 60604

Attention: Mr. Henry L. Longest, II
Director of Water Division

Re: Delaware County, Ohio
Project No. C 390693

Dear Mr. Longest:

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On August 22, 1973, a meeting was held at the City of Westerville, Ohio offices with the following in attendance:

Fred L. Stults, P.E.	- Delaware County, Sanitary Engineer
Gary W. Gilbert	- Delaware County, Ass't. Sanitary Engineer
O. H. Koeplin	- City of Westerville, City Manager
Thomas V. Singell, P.E.	- City of Westerville, City Engineer
Richard D. Jackson, P.E.	- City of Columbus, Director of Public Service
Robert C. Parkinson, P.E.	- City of Columbus, Ass't. Director of Public Service
Forest Grant, Jr., P.E.	- City of Columbus, Principal Design Engineer Sewerage and Drainage
Edward Wilson	- Sunbury, Ohio
Unknown Attendee	- Sunbury, Ohio
Paul M. Shepard, Jr., P.E.	- Burgess & Niple, Limited

Founded 1912

The question of extension of the City of Columbus sewerage facilities (Alum Creek and Big Walnut) into Delaware County was discussed. It was stated by the representatives of the City of Columbus that there was not capacity available beyond the present service area of Maxtown Road. However, they did state that they may be able to serve the eastern portion of Harlem and Trenton Townships with the Blacklick trunk sewer.

On October 18, 1973, Mr. Richard D. Jackson, P.E., Director of Public Service for the City of Columbus, sent a letter to the Director of Ohio EPA. This letter states that the City of Columbus was working very closely with the Delaware County Engineer on a possible alternative to plants on the Alum Creek Reservoir. This alternative included temporary discharge into the City of Columbus sewer system through Westerville. A copy of this letter is attached.

On October 30, 1973, another meeting was held in the offices of the City of Westerville with representatives of Delaware County, City of Columbus, City of Westerville, Corps of Engineers, Burgess & Niple, Limited and Nitschke, Godwin and Bohm. Attached is a "Memorandum" of this meeting. The following is quoted from Item "D" of the "Memorandum":

> "City of Columbus (Forest Grant) tentatively agreed as long as this is of a temporary nature and Westerville agrees to an amendment of their contract with Columbus."

On September 4, 1975, a meeting was held in Ohio EPA offices with the following in attendance:

Michael McMullen - U.S. EPA, Region V Planning
Catherine Grissom - U.S. EPA, Region V Planning
Gene Wojcik - U.S. EPA, Region V Planning
Kenneth Reed - Delaware County
Dean Miller - Delaware County
James Whitney - Delaware County
Fred Stults - Delaware County
Gary Gilbert - Delaware County
James Nottingham - Ohio EPA
Greg Smith - Ohio EPA
Louis C. Peltier - Enviro Control, Inc.
Robert Wolfe - Burgess & Niple, Limited
Albert Seiler - Burgess & Niple, Limited
Paul Shepard - Burgess & Niple, Limited

At this meeting, the status of the "EIS" was discussed in detail. It was our understanding that a similar meeting had been held with representatives of the City of Columbus on September 3, 1975, with discussion centered on the question of the City of Columbus receiving the sewage from Delaware County and was deemed not feasible.

There were other meetings with the City of Columbus concerning Delaware County sanitary sewerage such as the one on the City of Columbus "planning area" on June 24, 1975 in the Ohio EPA offices with the following in attendance:

Robert C. Parkinson - City of Columbus, Service Director
D. D. Robbins - City of Columbus, Supt. Div. of Sewerage & Drainage
George Walkenshaw - City of Columbus, Ass't. Supt. Div. of Sewerage & Drainage
Steve Kacmar - Malcolm Pirnie, Inc.
Dean Miller - Delaware County
Kenneth Reed - Delaware County
Fred Stults - Delaware County
Gary Gilbert - Delaware County
James L. Nottingham - Ohio EPA

Very truly yours,

BURGESS & NIPLE, LIMITED

Paul M. Shepard

Paul M. Shepard, Jr., P.E.

PMS:djr
Attachments
Letter of Sept. 2, 1969
Letter of Oct. 18, 1973
Memo, Oct. 30, 1973
cc: Delaware County Commissioners
Mr. Fred L. Stults, Delaware County Sanitary Engineer

J-33

MAYNARD E. SENSENBRENNER
MAYOR
WARREN J. CREMEAN, DIRECTOR
DEPARTMENT OF PUBLIC SERVICE

CITY OF COLUMBUS
OHIO
DIVISION OF SEWERAGE AND DRAINAGE
CITY HALL
COLUMBUS, OHIO 43215

CARL W. SCHOENE
CHIEF SEWERAGE ENGINEER

September 2, 1969

Burgess & Niple, Limited
2015 West Fifth Avenue
Columbus, Ohio, 43212

Attention: Mr. Robert G. Wolfe, P.E.

Gentlemen:

Under date of August 27, 1969 you addressed a letter to Service Director W. J. Cremean wherein you requested information concerning the intentions of the City of Columbus to provide sanitary severage service for a portion of Delaware County within the Olentangy River Basin.

As you know, we have constructed a portion and will soon start on the last portion of the Olentangy Main Trunk Sanitary Sewer. The design for this sewer was firmed up in 1959 and closely followed the recommendations of the 1954 Report by the Franklin County Regional Planning Commission.

Thus, this trunk is designed basically to serve the River basin from about Henderson Road northward to the Franklin-Delaware County line plus Mount Air. Even if this sewer should be found to have theoretically a slight excess capacity, it is certain that the O.S.I.S. which receives its discharge at a point south of Lane Avenue in Tisdale Street, cannot "take on any more customers" at least at that point.

We are very sorry the sewer does not permit extension well into Delaware County and while it may now look as though our program, with respect to all four major drainage areas, was short-sighted it appeared to be a rather bold plan when it was determined in 1955.

We suggest that you spend a small amount of time, pencil and paper on consideration of a pumping station-force main answer to your problem. Our treatment facilities can be expanded.

Yours very truly,

CARL W. SCHOENE
Chief Sewerage Engineer

CWS/in
cc: Director Cremean
C.W. Pinchett
Forest Grant
File

EXHIBIT I

TOM MOODY
MAYOR
RICHARD D. JACKSON, P.E.
DIRECTOR

CITY OF COLUMBUS
OHIO
DEPARTMENT OF PUBLIC SERVICE
Zip Code: 43215

JEROME C. GAFFORD
DEPUTY DIRECTOR
ROBERT E. PARKINSON
ASSISTANT DIRECTOR

October 18, 1973

Dr. Ira L. Whitman
Director, OEPA
450 East Town Street
Columbus, Ohio 43216

Re: Alum Creek Area - Sanitary Effluent

Dear Dr. Whitman:

It has come to my attention that the OEPA is reviewing the proposed treatment of sanitary effluent in the vicinity of the Alum Creek Dam. Various correspondence indicates to me that a decision as to the handling of this sewage is about to be made.

We have been working very closely with the Delaware County Engineer on a possible alternative to plants on the Reservoir. This alternative would include temporary discharge into the City of Columbus sewer system through Westerville.

I understand that this proposal is being vigorously pursued by the Delaware Sanitary Engineer with you and the Corps of Engineers. I strongly urge that no approval be given until this alternative has been thoroughly considered.

Thank you for your cooperation in this matter and if this office can be of assistance, please do not hesitate to contact me.

Very truly yours,

Richard D. Jackson, P. E.
Director

cc: Fred Stults
Col. Hill

RECEIVED
OCT 2[illegible] 1973
ENGINEER
DELAWARE COUNTY OHIO

MEMORANDUM

TO: Record

FROM: Larry L. Dock

DATE: October 30, 1973

RE: Westerville Council Chambers
October 26, 1973

Those attending:

Larry Dock	Burgess & Niple, Limited
Paul Shepard	" " "
Robert Wolfe	" " "
Gary W. Gilbert	Delaware County
Henry E. Shaw, Jr.	Delaware County Prosecutor
Kenneth Reed	Delaware County Commission
Clyde E. Lewis	Delaware County Special Com.
Dean Miller	Delaware County Commission
Forest Grant, Jr.	City of Columbus
D. D. Robbins	City of Columbus
David J. Lambert	Corps of Engineers
W. F. Hawley	Corps of Engineers
R. H. Hayes	Corps of Engineers
Thomas W. Singell	City of Westerville
O. H. Koeplin	City of Westerville
Friedl Bohn	Nitschke, Godwin, Bohm
Larry Helman	Nitschke, Godwin, Bohm
Fred L. Stults	Delaware County

County Engineer Fred Stults stated county's objection to Corps of Engineers' proposed package treatment facility below Alum Creek Dam. Offered an alternate plan.

Paul Shepard, Burgess & Niple, Limited, described alternate plan which entails:

A) The County constructing a trunk sewer and lift station along Alum Creek.

B) The lift station will discharge via a force main to one of two points in Westerville:

---

1) End of existing Columbus Trunk SAS at old Westerville Treatment Plant or,

2) End of proposed Alum Creek Trunk SAS to be constructed by Westerville to a point north of Main Street. (Plans to be complete by December 73) (EPA Grant to finance it)

C) This force main discharging into the Columbus or Westerville Trunk SAS would be a temporary situation. The lift station, would begin discharging into the proposed Powell Road Interceptor SAS when it and the proposed Delaware County Olentangy Environmental Control Center are completed.

D) City of Columbus (Forest Grant) tentatively agreed as long as this is of a temporary nature and Westerville agrees to an amendment of their contract with Columbus.

E) Westerville agreed (Mr. Koeplin)

F) The "Corps of Engineers" (Mr. Lambert) agreed to the fact the idea has merit, but felt any additional cost incurred by the "Corps" would have to be shared with someone (Delaware County).

G) The "Corps" agreed the timing of this alternate plan could fit their plans.

L.L.D.

JJ

J-35

26 October 1973 - Westerville, O

Name	
Larry Dock	Burgess & Niple,
Paul Shepard	" "
Bill Wolfe	" "
Gerald W. [illegible]	Delaware Co.
[illegible]	Delaware Count. [illegible]
[illegible]	" " [illegible]
[illegible]	" " [illegible]
[illegible]	" " [illegible]
[illegible]	City of Columbus
D.D. [illegible]	"
David J. Lambert	Corps of Engineers
W.F. Hawley	" " "
R.H. Hayes	" " "
[illegible] W. [illegible]	City of Westerville
O. H. [illegible]	" " "
[illegible]	[illegible] Godwin, [illegible]
Larry H. [illegible]	" "
[illegible]	Delaware County